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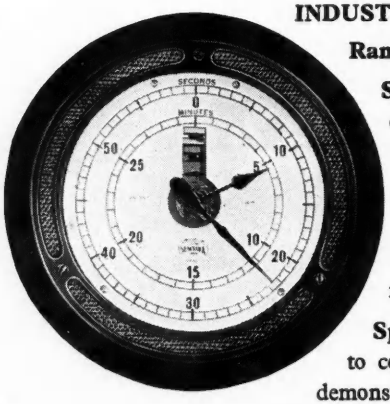

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ELECTRICAL REVIEW

Vol. CXLVI No. 3777 14TH APRIL, 1950

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

University Training

TECHNOLOGY AND CULTURE

VIEWS recently expressed on university education for engineers seem in some instances to be based upon a misconception of the place of engineers in society and of what industry requires of them. A sharp division of opinion between two schools of thought was evident during the recent debate on technological training at the Royal Society.

The discussion was centred on whether technologists should be segregated in universities restricted to their own specialities (which looks almost like a contradiction in terms) or whether approach to their subjects should be, as in the other professions, through the communal life of universities in the ordinary sense of the word. In these they would associate with students of a wide variety of subjects and concern themselves more with basic scientific principles than with technical details which may be of ephemeral importance only.

Cost of Equipment

Common ground in this discussion was the need to secure as soon as possible a supply of men of the highest technical attainments to maintain the country's industry. Fears were expressed that the influx into the universities of the requisite numbers of engineering students would upset the balance of the faculties. It was also urged that only at a purely technological university would there be enough students to justify the high cost of providing heavy laboratory equipment.

On the other hand, it has been pointed out that an experimental technological institute of the requisite standard would take several years to complete and that it could be staffed and equipped only at the expense meanwhile of existing educational arrangements. The reference to the possibly adverse effects on the latter of coping with greater numbers of engineers is countered by the evidence that industry could absorb only about 10 per cent more men of the undergraduate type than at present, whereas the universities could easily accommodate twice that number.

Regarding laboratory apparatus, the more costly kinds are required mainly in post-graduate work rather than in undergraduate studies and are, or can be, made available elsewhere.

Administrative Responsibility

In a subsequent letter to *The Times* Dr. Percy Dunsheath showed that comparison between the education of technologists and technical training had fogged the issue. Industry looks to the universities, he pointed out, to provide leaders capable of making a fundamentally scientific approach to the problems of the future as well as those of to-day, and of accepting the highest administrative responsibility. These qualities are most easily fostered at a university with its varied cultural background, as Professor E. B. Moullin pointed out in dealing with the relation-

ship between the universities and industry in his presidential address to the Institution of Electrical Engineers, since one of its aims is to teach men to continue to learn for themselves throughout their lives. The industrial need quantitatively (and, of course, in their own sphere qualitatively also) is for many more men with "know-how" attributes who have been trained at technical colleges, but these are not here under consideration. We conclude by expressing agreement with Dr. Dunsheath's argument that the existing universities are capable of meeting the demands made on them by industry (their strong position has been the theme of a broadcast by Professor P. M. Blackett on the "Third Programme") and that the proper course is to strengthen the facilities they provide rather than to make *ad hoc* arrangements in specialized institutes.

PAYING IT BACK

In the first year's accounts of the British Electricity Authority, the Electricity Boards were shown to be holding in suspense a surplus of £3,761,141 derived from the "Clow" surcharge-rebate system. After the close of the period this was reduced by the operation of the rebate but there was still something over a million pounds left. In pursuance of the promise that this would be refunded to the consumers who had provided it, the Boards are now announcing a further rebate, ranging from 0.18d to 0.2d per kWh, on a quarter's consumption. This, it is to be hoped, will be the last of this rather ineffectual business.

CANADIAN TOLERANCE

Import trade can be complementary to or competitive with home production. In the latter case there is a great incentive to manufacturers to ask for protection and for their Government to grant it—in the form of restrictions or high duties. In pursuing their search for dollars British manufacturers were bound to come up against this problem, for both the United States and Canada are producers of much of the kind of goods we aim at exporting to them. The attitude of the United States Government is sympathetic, but that of its manufacturers is uncertain. Last week the Canadian Prime Minister (Mr. St. Laurent) and the Minister of Trade and Commerce (Mr. Howe) both referred to this matter. They made it clear that while they realized that imports from Great Britain might have an adverse effect upon Canadian producers, there could be no attempt to shut them out. Only by permitting the free competition of British goods with Canadian could Canada help to secure the restoration of world trade, which was essential to the country's prosperity.

B.E.A.'S CLAIM

Reports have appeared in the daily and local Press that a number of municipal authorities have been served with writs on behalf of the B.E.A. which claims amounts stated to have been paid out of electricity funds before nationalization. It is understood that negotiations are proceeding with the authorities concerned and so any comment upon the subject must be withheld for the time being. Apparently the main point at issue is the payment of amounts in aid of the rates from the funds of electricity departments. Reference has also been made in some reports to rebates granted to consumers in the period immediately preceding nationalization.

"TAX ON CLEANLINESS"

At the eleventh hour (the Budget is to be presented next Tuesday) the Electrical Development Association is making a last effort to impress on M.P.s the necessity for removing the purchase tax from domestic electrical appliances. This takes the form of a second letter; the first, sent to members on 28th February, presented a reasoned case for the abolition of the tax. It is now reinforced by a quotation from the official report on an "Inquiry into Domestic Water Supply in Great Britain" which stressed the value of water-heating equipment in the home. The report also seemed to indicate that the number of electric water heaters in use was not so great as their convenience and efficiency would warrant. The inflation of the cost by purchase tax must be largely to blame. In his letter Mr. V. W. Dale, general manager of E.D.A., describes the impost as "a tax on cleanliness." The case was also well put by Dame Caroline Haslett in this week's *Sunday Times*.

The steps of the main entrance are illuminated indirectly to 4 lumens/sq ft by means of two fittings concealed in built-in stone troughs

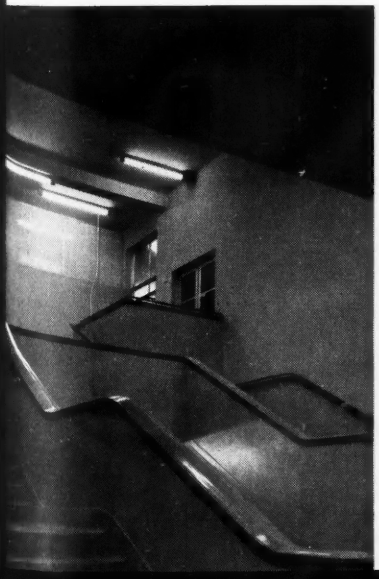
Factory Installation

Modern Lighting Methods Demonstrated at Airdrie

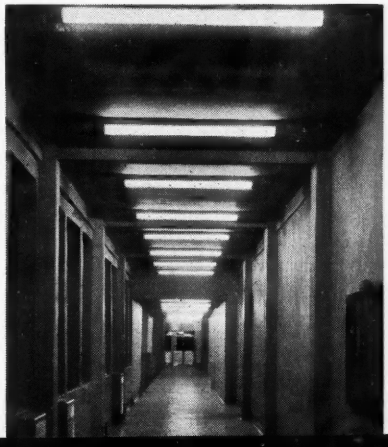
AN outstanding example of the latest technique in illuminating industrial premises is provided by a new factory which Boots Pure Drug Co., Ltd., has opened at Airdrie, Lanarkshire. A total of 430,180 sq ft of floor area has been lighted, representing an installed load of 364 kW, or 0.84 W per sq ft, and of this all but 41 kW is fluorescent lighting. In addition, a further 21 kW of fluorescent and mercury vapour lighting is used for the approach roads. Altogether 4,241 "Mazda" fittings have been installed, 3,817 of them being of the fluorescent type.

In accepting as a basis of minimum illumination values the Illuminating Engineering Society's Code of Lighting Intensities, a fairly high level of illumination has been adopted throughout the factory and offices. To reduce any discomfort to employees when entering or leaving the premises an even gradation has been aimed at rising in five stages from 2 lumens/sq ft outside to 35 lumens/sq ft in some working areas. The steps in the main entrance are illuminated to 4 lumens/sq ft by means of totally indirect lighting from two fittings concealed in built-in stone troughs.

For the entrance hall the British Thomson-Houston Co., Ltd., designed two lines of special fittings to give the effect of illuminated beams resting on pilasters, 5ft and 2ft fluorescent lamps being enclosed in ribbed opal "Perspex" with a high transmission factor: the intensity is raised in the entrance to 6-8 lumens/



On the staircase 5ft fluorescent lamps are enclosed in ribbed "Perspex" fittings



A lighting intensity of 15 lumens/sq ft and over is employed throughout the corridors

sq ft and 10-12 lumens/sq ft in the hall. Decorations and floor designs were also recommended by the B.T.H. Co.

The lighting intensity in the corridors is increased to 15 lumens/sq ft and over. To make the lighting as unobtrusive as possible all fittings are mounted direct to the ceiling and fitted with reeded clear "Perspex" covers in the offices, canteen, kitchen, etc., and sand-blasted covers in the Industrial Health Unit. In the offices, the fittings are arranged in squares or rectangles. For the canteens, continuous lines of mixed 4ft and 5ft fittings are used, broken only by the deep structural beams. All wiring and conduits are concealed and all switches, switchplugs and fuseboards are of the flush type, the fuseboards being specially made by Boots engineers to suit the restricted positions between windows.

Special Reflectors

To achieve the intensity called for in the large packeting areas, it was found that fittings would have to be fitted to the roof trusses with only a short space between each fitting. For the sake of appearance, therefore, it was decided to make special reflectors which were designed with tolerance holes for supporting the fittings from conduit, these being found necessary to overcome the difficulty of alignment. Fixed lampholders at one end of the fittings were also considered essential to facilitate lamp removal at high levels.

To maintain the appearance of spaciousness in the buildings during hours of artificial illumination all fittings are slotted to give a small amount of upward lighting. For maintenance purposes every fitting is fed through a Gregg type ceiling rose which is virtually a three-pin plug and socket and allows the isolation of any fitting without having to switch off others nearby on the same circuit. At the ends of rows, the use of ceiling-type cord-operated switches simplifies and reduces the cost of the wiring and is also more convenient. No special precautions to eliminate possible stroboscopic effect were considered necessary.

As vitreous enamelled reflectors were costly and difficult to obtain, an alternative type of reflector was chosen, and also units were finished in "Kemplastite" enamel to resist corrosion and discoloration. Dispersive reflectors are used in all cases except for lavatories and cloakrooms, where no reflectors are considered necessary. "Perspex" diffuser covers fitted to staircase lights prevent discomforting glare. Fluorescent fittings are built into the cages of the two 2-ton lifts, and goods service subways are illuminated by 100 W tungsten low surface brightness bulkhead fittings. Low voltage hand lamps operate from portable transformers which plug into the 230 V switch-plugs. Ancillary buildings are treated similarly to the main factory with the exception of a flameproof area using eighteen 300 W tungsten fittings.

The mounting height of all fittings is kept as great as possible, generally about a foot below truss level, this allowing trusses to be used for fixing and at the

In the canteen kitchen a lighting intensity of 15/20 lumens/sq ft has been adopted. All fittings are mounted direct to the ceiling

same time permitting other services to pass over without restricting downward light.

For the front road lighting three-lamp 5ft "Mazda" fluorescent lanterns on 25ft concrete columns (Concrete Utilities, Ltd.) have been selected, it being considered that these avoided complaints of colour distortion and blended best with the architecture of the building, which is constructed of locally quarried stone. The choice was made, despite the higher capital outlay, after comparative tests with sodium discharge, h.p. mercury vapour and tungsten units. Spacing of the columns varies between 70 and 85ft. Utilizing eight twin lanterns and ten single units, an illumination of about 2 lumens/sq ft is obtained at road level. Single and twin arm 250 W and 400 W h.p. mercury vapour lanterns mounted at 25ft on concrete columns are used for the rear roads and railway sidings, spacing being between 110 and 120ft. The 400 W units are employed in working areas and along the busiest road.

Power and Other Services

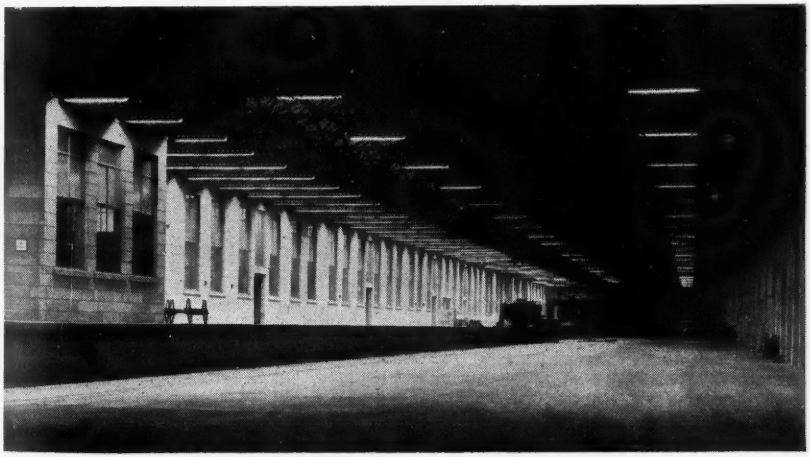
Apart from the 385 kW of installed lighting load, the factory has an installed power load of 566 kW, plus 200 kVA for fire pumps. Approximately 460 motors are installed, mainly of B.T.H. or L.D.C. manufacture, varying in size from fractional h.p. to 35 h.p. Nearly all of these are equipped with Crabtree controllers, fitted with isolators and hoseproof push-buttons, gasketed lids and tanks.

Production equipment includes such electrically operated apparatus as pumps for transferring liquid raw materials from store to the manufacturing area; ointment and tablet making apparatus; weighing, bottle washing, bottling, capping and labelling machines. Much of the apparatus is automatic or semi-automatic.

Two 2 ton Evans goods lifts and one 15 cwt Marryat & Scott canteen service lift have already been installed and provision is made for a further 2 ton goods lift. The goods lifts are equipped with power-operated doors and automatic levelling. Besides a number of small electric hoists, there are two overhead travelling cranes, one Butterley 3 ton and one Vaughan 1 ton.

Nine sets of power-operated doors (G.D. Peters) are actuated by compressed air door engines controlled by photo-electric cells (G.E.C.), the doors closing automatically after a predetermined time delay. Each of ten electric trucks, including a 1½ ton fork lift truck, has its own charger fitted with metal

In the 552ft by 75ft loading bay 174 5ft 80 W "Mazda" fluorescent tubes mounted at 20ft above dock and 24ft above road provide a lighting intensity of 15 lumens/sq ft on the dock and 3.5 lumens/sq ft on the roadway. There is a similar bay at the other end of the factory

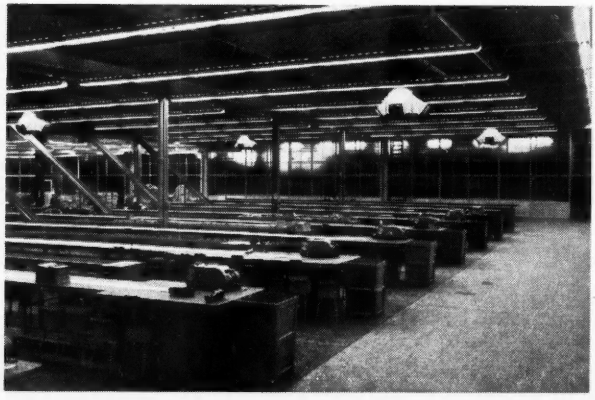


rectifier and automatic relay for stopping the charging at the correct time.

The heating of the factory is controlled electrically by "Satchwell" thermostats operating groups of electrically driven steam heater units which can be changed over by switches to hand control at the master controllers when desired, thermostats also operating motorized valves in the circuits of a low pressure hot water system. The heating in the office block is further controlled by means of an outside "weatherstat" which anticipates changes taking place inside the building.

An Ericsson 120 line (with provision for extension to 150 lines) private automatic exchange for the departmental telephone system is installed. A public address system supplied by the G.E.C. and also an International "Supervised" clock system is installed throughout the buildings. A teleprinter provides direct communication with the Nottingham offices.

To supply electricity to the factory, the South West Scotland Electricity Board has looped into its 10,000 V ring main to feed two 750 kVA 10,000/420 V trans-



Reflectors specially designed to facilitate alignment have been fitted throughout the large packeting areas

For the front road lighting three-lamp 5ft "Mazda" fluorescent lanterns have been erected on 25ft concrete columns. Spacing of the columns varies between 70 and 85ft

formers, a separate 10,000 V supply feeding a J. & P. 200 kVA step-down outdoor transformer serving two automatically controlled direct-to-line Mather & Platt 100 h.p. motors for fire services.

Main 400 V switchgear (J. & P.) is installed in four switchrooms and one substation and comprises fifteen 200 A and six 600 A air circuit breakers fitted with h.r.c. tripping fuses, the blowing of any one fuse tripping all three phases. Earth leakage protection is provided by means of core-balanced transformers operating earth leakage striker fuses. A 1,600 A off-load isolator is installed to isolate low voltage substation switchgear from the Electricity Board's switchgear with means for tripping the Board's main low voltage circuit breaker in emergency.

From the above switchgear there are fed 123 distribution fuseboards, the main units being part of the switchgear and of J. & P. manufacture and the factory distribution fuseboards being mainly supplied by the Simplex Electric Co., Ltd. Thirty-three Ferranti meters are incorporated for departmental costing purposes.

Over 152 miles of cable and over 30 miles of conduit in varying sizes from ⅜in to 2in have been used for lighting, power, clocks, fire alarm system, thermostats, loudspeakers and telephones. In addition about 3½ miles of main cables have been laid to supply switchrooms, telephone mains and road lighting. The heavy cables were supplied and laid by British Insulated Callender's Cables, Ltd. Pyrotenax mineral insulated cable is employed for the boiler house installation.

The building and services were designed by Boots engineers, and all civil, electrical and mechanical work was carried out under their control. The whole of the electrical installation was executed by Boots Electrical Department to plans prepared by their own engineers.

We thank Boots Pure Drug Co., Ltd., for its help in preparing this article and also the British Thomson-Houston Co., Ltd., for supplying the photographs.

Tummel-Garry Scheme

First Clunie Set Started Up

WHEN Provost G. T. M'Glashan, of Auchterarder, moved a lever in the Clunie generating station on Saturday the first plant in the Tummel-Garry hydro-electric scheme began to provide power. Provost M'Glashan, a member of the North of Scotland Hydro-Electric Board, is chairman of the Consultative Council for the district. Clunie generating station is three miles from Pitlochry.

Electricity produced by the Clunie station is fed into the Hydro-Electric Board's main transmission system, which extends over the Southern and Central Highlands and the east coastal district north of Inverness. Aberdeen, Dundee and Perth are also connected to this network. Surplus power generated by the Clunie station goes to Central Scotland.

Members of the Board and their engineers watched the first machine at Clunie being started up and brought to full load of 19,000 kW. The party also viewed the other sites of the Clunie and Pitlochry sections of the project where there is still a considerable amount of work to be done before the scheme is completed. The ceremony at the Clunie station on Saturday last was a private one; the official opening will probably take place in the autumn. Work on the Clunie section of the scheme began four years ago, the principal part being the construction of the two-mile tunnel which carries the water from Loch Tummel to the power station. Waters of the loch, which will ultimately be raised 17ft, are diverted into the tunnel by Clunie dam, 386ft long and 65ft high. The tunnel is driven through Cammoch Hill and took three years to construct. Pipe lines at the station are to be covered with earth and grass sown.

Two further 19,000 kW sets in the Clunie station and two 7,500 kW sets at Pitlochry will be brought into service successively and will be in operation before next winter. During March the stations of the Board, including Loch Sloy, contributed a maximum of 55,000 kW to the grid.

Trolley-buses in Canada.—The Hamilton (Ont.) Street Railway company is to inaugurate a trolley-bus service next August, using a fleet of 20 vehicles. The estimated cost of the scheme is $650,000.

VIEWS on the NEWS

By REFLECTOR

WRITING in the *Electrical Contractor*, Mr. D. C. Mallam, director of the Federation of Specialists and Sub-Contractors, says that local authorities, before granting to contractors a licence for work to be carried out for clients, refer to the nationalized supply industry for an assurance that power will be forthcoming. Mr. Mallam says that this provides the competing contracting department of the nationalized industry with a direct introduction to the client. But surely if the contractor has already been given the work the "nationalized industry" cannot get it. And surely, if it could, it would not stoop to try to secure it. If the trouble is the subsequent sale of appliances, well the Board will get to know anyway upon being asked for a supply.

★ ★ ★

If the Yorkshire Electricity Board wishes to give its representatives a real test of their ability to sell electricity it should send them to a farmer mentioned by the *Sheffield Telegraph*. Electricity has come to his village but he stands firm. He thinks that a paraffin lamp is just as good as electric light. He objects to overhead lines, considering that the distribution should be underground, and he fears the electrocution of cattle. Still looking on the dark side, he asks what would happen to a batch of eggs in an electric incubator if the supply failed. He flatly says of electricity: "I don't believe in it," which seems to be final enough.

★ ★ ★

Far from lessening the attractions of the Scottish Highlands the hydro-electric schemes have already brought to the country large numbers of visitors from all parts of the world. Referring particularly to the Tummel-Garry project, I am told that now the dams are nearing completion there is, among former critics, an attitude even of appreciation. One point now clear is that the public will not only have access to the dams and will be able to walk across them by specially constructed footpaths, but will also get a good view into Pitlochry power station. One hotelkeeper has, in fact, advertised "Come to Pitlochry and see the hydro-electric scheme."

★ ★ ★

Preparations are now in hand in many towns for large-scale autumn illuminations to extend the holiday season. There is no doubt of the effectiveness of such schemes; in fact, their very success has given rise to some opposition because of the congestion brought about by the crowds. For obvious reasons the illuminations are usually welcomed by local traders. However, a note I have received from a correspondent suggests that one Council is taking no chances. Stating that an illuminations scheme has been approved, the report adds: "The Council hopes that hotel, boarding house and apartment house proprietors will co-operate, and steps are being taken to bring this about."

★ ★ ★

I am a little old-fashioned in the matter of qualifications and am appalled at the growing tendency to sport the initials of all kinds of little-known organizations. What, for instance, do the following signify to the general public: "A.M.Inst.B.E.", "A.Inst.Ex.O.", "A.S.C.", "F.Comm.A.", "M.I.Ec.E." There was a time when this sort of thing was practised only by "professors" of dancing and such, but now it seems to be getting into engineering.

★ ★ ★

It is reported that Chester Rural District Council has been asked by the B.E.A. to provide a temporary supply of 50,000 gallons of water per day during the period of construction of a power station at Ince Marshes. I dare say that some wag will want to know whether the workmen need all that amount of tea.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Home Lighting Practice

WITH reference to the letter on this subject in the *Electrical Review* of 31st March, anyone inquiring into the progress that has been made in home lighting practice during recent years should bear in mind the conditions under which much installation work was done during a period of two or three years before, and after, the end of the war.

It was very largely a matter of making the best use of what could be scraped together in the way of material and fittings rather than working to a carefully prepared specification.

In addition, so far as Council housing schemes were concerned, the price restrictions imposed by the Ministry left little scope for the provision of lighting installations embodying the latest practice.

J. F. LAMB.

Cambridge.

Milk Cooling

I SHOULD like to accept as gracefully as possible Mr. Ebdon's rebuke in the *Electrical Review* of 31st March on what was really, on my part, the misuse of a word. I was, of course, aware of the chilled-water cooler exhibited at Lincoln and long before that the Milk Marketing Board must have had more than an inkling of what chilled water could do from reports which they would have been receiving about the Cornwall installations, some of which were running well before the Lincoln Show.

What I should have said in referring to the Wessex installation in Oxfordshire was that this must have given the Milk Marketing Board a real demonstration of what this kind of plant could do on a farm.

I am, however, more concerned with supporting Mr. Ebdon's claim for credit for the Milk Marketing Board in stressing the need for simple and low-priced milk cooling plant. All along that has been their firm aim and while they have been substantially responsible for a method of meeting this requirement which has received some criticism from Area Boards and refrigeration manufacturers, there can be little doubt that the Milk Marketing Board have done good work in forcing manufacturers to come into the market on a competitive basis. Above all the M.M.B., and Mr. Ebdon in particular, have always stressed the importance of electricity in running a clean-milk farm.

C. A. CAMERON BROWN,
Agricultural Electrification Adviser,
British Electricity Authority.
London, S.W.1.

N.S.W. Plant Programme

A NOTE in *Tenders* (Australia) states that plans for extensions of major generating plants in New South Wales are based on the assumption that the demand on the systems will more than double by 1960. At 30th June last the total rating was 833,000 kW. Additions aggregating 740,000 kW have been approved at a cost in the neighbourhood of £A48,000,000. In the years 1950-53 the annual rate of installation is expected to be 50,000, 90,000, 105,000 and 265,000 kW, respectively. Extensions in hand are as follows:—

Sydney County Council: Bunnerong, 50,000 kW; Pyrmont, 200,000 kW; Lugarno, 100,000 kW.

Department of Railways: White Bay, 100,000 kW; Lithgow, 30,000 kW; Lake Macquarie, 150,000 kW.

Electric Light & Power Supply Corporation: Balmain, 50,000 kW.

Southern Electricity Supply: Lake Illawarra, 60,000 kW.

Transmission lines operating at 132 kV will be built from Lake Macquarie to Sydney and Newcastle, the former interconnecting with lines to Port Kembla (Lake Illawarra), Lithgow and the Lugarno station. The Southern Electricity Supply transmission system between Port Kembla and Burrinjuck will ultimately be connected with the proposed station at the Hume reservoir. These systems will then form a major grid for the southern part of the State.

PERSONAL and SOCIAL

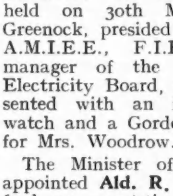
News of Men and Women of the Industry

THE South West Scotland Electricity Board has appointed **Mr. A. A. Wallace,** A.A.C.C.A., as chief accountant in succession to **Mr. C. W. Flint** who is taking up a similar appointment with the East Midlands Electricity Board. Mr. Wallace, who is forty-eight, was one of Mr. Flint's principal assistants and before vesting date was accountant to the Glasgow Corporation Electricity Department. He will take up his duties as chief accountant early in May.

Mr. W. A. Woodrow, A.M.I.E.E., has retired from the position of district manager, Greenock District of the South West Scotland Electricity Board after forty-four years in the electricity supply industry. Before vesting day Mr. Woodrow was burgh electrical engineer at Greenock. At a presentation ceremony held on 30th March at Dellingburn, Greenock, presided over by Mr. D. Ross, A.M.I.E.E., F.I.E.S., Clyde Sub-Area manager of the South West Scotland Electricity Board, Mr. Woodrow was presented with an inscribed gold wristlet watch and a Gordon tartan travelling rug for Mrs. Woodrow.

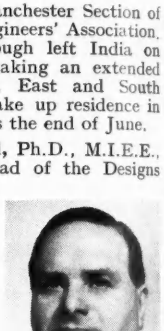
The Minister of Fuel and Power has appointed **Ald. R. Barber,** J.P., of Bradford, as a part-time member of the Yorkshire Area Electricity Board.

Mr. H. Lythgoe Reddyhough, A.M.I.E.E., M.Inst.F., retired from the position of chief engineer to the Gourepore Electric Supply Co., Ltd., West Bengal, India, on 22nd March, after over twelve years' service with the company. Among his many other activities in India, Mr. Reddyhough was for eleven years a member representative of large undertakings on the Committee of the Association of Electricity Undertakings, Bengal, and last year he was vice-chairman of the Calcutta Overseas Branch of the Institution of Electrical Engineers. Before going to India he was station superintendent at the Back o'the Bank power station, Bolton, and was a past chairman of the Manchester Section of the Electrical Power Engineers' Association. Mr. and Mrs. Reddyhough left India on 22nd March and are making an extended trip home via Ceylon, East and South Africa, and expect to take up residence in the London area towards the end of June.



Mr. H.L.Reddyhough

Mr. A. R. A. Rendall, Ph.D., M.I.E.E., has been appointed head of the Designs Department of the B.B.C. following **Mr. H. B. Rantzen's** resignation. Dr. Rendall joined the Lines Department of the B.B.C. in 1935 from the International Standard Electric Corporation, where his work on non-linear distortion on loaded cable circuits earned him the degree of Ph.D. In 1941 he was appointed assistant head of the Lines Department, and in 1947 he became assistant head of the Designs Department.



Dr. A. R. A. Rendall

Mr. H. Walker, O.B.E., A.M.I.E.E., has been appointed engineer-in-charge of the London television station at Alexandra Palace in succession to **Mr. H. W. Baker,** who was recently appointed assistant superintendent engineer, television. Mr. Walker has been with the B.B.C. since 1931 and joined the staff of the London television station just before it opened in 1936, returning as assistant engineer-in-charge when the service was restarted in 1946. He served in the R.A.F. during the war.

M. Caquot, the distinguished French civil engineer, has been elected president of the International Organization for Standardization (I.S.O.) in succession to **Mr. H. Coonley** of the United States.

Mr. J. Eccles, chairman of the Merseyside and North Wales Electricity Board, has been elected president of the Liverpool Engineering Society in succession to **Mr. A. Caldwell.**

Mr. J. Innes, C.B., whose retirement from the post of managing director of Cable & Wireless, Ltd., was reported in our last issue has been appointed to the board

of the Telegraph Construction & Maintenance Co., Ltd.

Mr. Low Tang Chang, managing director of Low Tangchang, Ltd., manufacturers' representatives, importers and exporters, of Singapore, is visiting the British Industries Fair, and expects to arrive in London on 3rd May. While in London he will look for additional agencies. Communications may be addressed to him c/o the Hong Kong & Shanghai Banking Corporation, 9, Gracechurch Street, London, E.C.3.

Mr. D. E. Webb has been appointed a director of the Kalgoorlie Electric Power & Lighting Corporation in the place of Sir Harold Moore who has retired from the board.

Mr. I. J. St. A. Crawshaw, B.Sc (Eng.), M.I.E.E., A.M.I.T.A., has resigned from the board of Airmec Laboratories, Ltd., a subsidiary of the Radio & Television Trust group. Mr. Crawshaw joined the Laboratories in 1944, shortly after their formation, as patents manager for the group, and later was appointed sales manager and director of the Laboratories.

After more than fifty years' service each with the Sunderland Forge and Engineering Co., Ltd., **Mr. E. Aird,** works manager of the electrical department, and **Mr. J. J. Rutter,** manager of the switchboard department, have retired. Mr. Aird has been succeeded by his assistant, **Mr. G. W. Keith.**

Mr. L. H. Peter has been elected chairman of the Radio & Electronic Component Manufacturers' Federation for 1950-51. The vice-chairman is **Mr. H. V. Slade** and the treasurer, **Mr. G. G. Kent.**

Commander C. F. Nock, D.S.O., R.N. (Retd.), has joined the board of the Tuscan Engineering Co., Ltd., and will assume reponsibilities for the sales organization of both the parent company and Tuscan Industries, Ltd.

Mr. J. M. Blades, Associate I.E.E., A.M.Am.I.E.E., has recently been appointed cable and special projects engineer to the Hydro-Electric Power Commission of Ontario, Canada. Mr. Blades held positions with Callender's Cable & Construction Co., Ltd., and the Northampton Electric Light & Power Co., Ltd., before becoming distribution engineer to the Barbados Electric Supply Corporation, Ltd., in 1945.

At the twenty-first birthday dinner of the Bristol Branch of the **Electrical Association for Women** on 4th April Mr. S. F. Steward, C.B.E., chairman of the South Western Electricity Board, proposed a toast to the Association and to its founder, Dame Caroline Haslett, who was the guest of the evening. Mr. Steward said that, after doing valuable work for war charities and assisting with the recent fuel economy campaigns, the E.A.W. could now revert to its original purpose of encouraging the fullest possible use of electricity in the home. Although the peak load problem was likely to continue for a few years more, at all off-peak hours there was abundant electricity. Dame Caroline, in responding, said that the Association was pleased to hear that the electrical age was really coming back again. The only way the nation could survive and have a decent way of living was by substituting to a large extent electrical energy for human energy.

The Steel Company of Wales, Ltd., has announced that **Mr. J. H. Groocock,** B.Sc. (London), was recently appointed chief electrical engineer for its Abbey, Margam and Port Talbot works. On obtaining his degree, Mr. Groocock spent two years with Sulzer Bros, Ltd., at their head office and works at Winterthur, Switzerland. In 1934 he returned to this country to take up a post with Imperial Chemical Industries, Ltd., at Birmingham, and in 1939 was transferred to Swansea, becoming regional electrical engineer for the South Wales factories of the Metal Division. He remained in this position until taking up his present appointment.

OBITUARY

Mr. G. H. Nash.—The death is reported, on 7th April, of Mr. George Howard Nash, C.B.E., M.I.E.E., who was associated with the Western Electric Co., Ltd., and Standard Telephones & Cables, Ltd., for many years and during the last war was deputy director, Ministry of Aircraft Production. Mr. Nash was born in 1881 and after education at the Grocers' School and Northampton Polytechnic served an apprenticeship with the National Telephone Co., Ltd. He joined the Western Electric Co. in 1905 and was subsequently chief engineer of Standard Telephones & Cables, Ltd., assistant European chief engineer and later European chief engineer of the International Standard Electric Corporation. He became executive vice-president of the International Telephone & Telegraph Laboratories, Inc., in 1929, and, additionally, vice-president of the International Standard Electric Corporation and the Mexican Telephone & Telegraph Co. He was a director of the International Telegraph & Telephone Co. from 1928 to 1933 and of Standard Telephones & Cables, Ltd., from 1927 to 1938. From 1930 to 1934 Mr. Nash was Chairman of the International Marine Radio Corporation and from 1933 to 1938 technical consultant to the International Standard Electric Cor-

poration. During the 1914-18 war Mr. Nash worked in submarine detection and developed the "seismophone" and the "fish hydrophone."

Mr. F. Hope-Jones.—The death occurred on 3rd April at the age of eighty-two of Mr. Frank Hope-Jones, M.I.E.E., F.R.A.S., the well-known horologist. Mr. Hope-Jones commenced work in an insurance office in Liverpool and in his spare time experimented with clocks and clockwork. He applied a contact to an old clock and conceived the idea of driving other clocks from it. Thus the idea of modern electrical impulse clock practice was born. In 1895 he coined the trade name "Synchronome" and started a small concern for the manufacture of electrical impulse clocks.

In 1910 he read a paper before the Institution of Electrical Engineers and was awarded an Extra Premium. In 1912 the Synchronome Co., Ltd., was formed and he became managing director. In that year he commenced his association with Mr. W. H. Shortt, M.Inst.C.E., in the design and development of the Synchronome-Shortt free pendulum, a clock which was later to capture all world's records for timekeeping and which, in the late 1920's, was to become the time standard at Greenwich Observatory where he installed his first free pendulum in 1924. In 1925 he equipped the premises of the then British Broadcasting Co. and originated the idea of the six pips time signal. In 1935 he was awarded, jointly with Mr. Shortt, the gold medal of the Franklin Institute of Philadelphia for his work in the field of time determination. When the war broke out in 1939 he retired from active management of the Synchronome Co. but remained on the board until August last year, when he finally retired. He was a fellow, past chairman, vice-president and gold medallist of the British Horological Institute, and honorary member of the Horological Institute of America and the Horological Society of New York, first fellow of the New Zealand Horological Institute, past chairman of the Wireless Society of London and the Radio Society of Great Britain. He was also a Medallist of the Royal Society of Arts. He was a prolific writer of books on electric clocks.

Sir James Henderson. — The death occurred on 7th April of Sir James Blacklock Henderson, D.Sc., LL.D., M.I.E.E., F.Inst.P., who was Professor of Applied Mechanics at the Royal Naval College, Greenwich, from 1905 to 1920. Sir James was born in Scotland in 1871 and was educated at Glasgow and Berlin Universities. After four years as a lecturer in physics at the Yorkshire College, Leeds, he joined Barr & Stroud, Glasgow, as head of their scientific department. In 1901 he was appointed lecturer in electrical engineering at Glasgow University and from there he went to the Greenwich Naval College in 1905. After his retirement from Greenwich he acted as adviser in gyroscopic equipment to the Admiralty until 1925. Sir James was president of the Engineering Section of the British Association in 1927 when he advocated in his address improvements in the patents system, especially to protect inventors from loss due to protracted development periods. He was responsible during his career for many improvements in naval gunnery.

Mr. Reginald Henry Symonds, founder and chairman of Symonds & Sons, Ltd., and R. H. Symonds, Ltd., of 47, Victoria Street, London, S.W.1, died on 4th April at his home near Dymchurch, Kent.

Mr. A. J. Evans, senior partner of A. J. Evans & Son, electrical wholesalers, died on 2nd April. Mr. Evans had been associated with the electrical industry for thirty years.

Captain W. Scott, managing director of the Normand Electrical Co., Ltd.. died on 3rd April.

WILLS

Mr. G. A. Pemberton, manager of the Acton branch of Brown Bros., Ltd., who died on 22nd Dec. last, left £13,616 gross (£12,552 net).

Mr. W. A. Walker, A.M.Inst.C.E., borough electrical engineer of Kettering 1905-1943, who died on 3rd February last, left £9,268 gross (£9,141 net).

Properties of Aluminium

WE have just received from the Aluminium Development Association a copy of Information Bulletin No. 2 which deals with the properties of aluminium and its alloys. This new edition is a revised version of the initial publication issued by the Wrought Light Alloys Development Association dealing only with wrought materials, and is timely with the publication of most of the new series of British Standard Specifications for aluminium and aluminium alloys in both cast and wrought forms. Quotations from B.S.1470/7 and 1490 are made and in addition to the tables of mechanical properties there are notes on characteristics affecting the design, a section on durability and another dealing with working methods in relation to the properties of the materials. Copies of the publication are available from the Association at 33, Grosvenor Street, London, W.1, price one shilling.

Electricity in Greece

Proposed Reconstruction with American Aid

By F. WIRTH

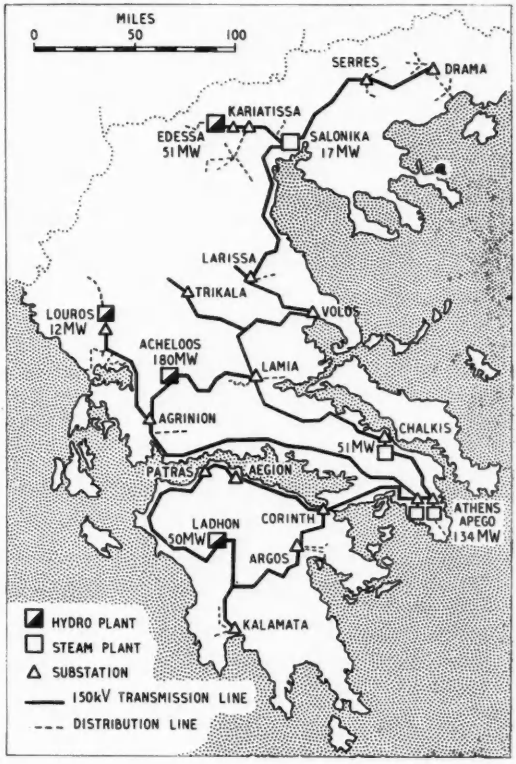
IN its first report to the Economic Co-operation Administration (covering the 1949-50 programme) the Organization for European Economic Co-operation indicated that not less than one-third of the total Greek demand for machinery under the Marshall Aid plan would be earmarked for power requirements.

Greece has to-day one of the lowest rates of *per capita* consumption in Europe. Among Marshall Aid countries Greece is last but one in respect of installed generating plant capacity, but Iceland (smallest capacity) has a population of only 130,000 compared with Greece's 7,500,000. The present total installed capacity in Greece is 150,000 kW, the net productive capacity of existing hydro-electric plant amounting to a bare 9,000 kW. The annual output in Greece does not exceed 500 million kWh. This compares with 700 million kWh in Ireland, 750 million in Turkey, 5,000 million in Austria, 10,000 million in Switzerland and 30,000 million in France.

Even before the war only one-fifth of the country's inhabitants consumed electricity, supplied by 340 undertakings, of which not fewer than 90 have been destroyed in the civil war. About two-thirds of the electricity generated is consumed in the Athens-Piræus region, where most of the industrial and domestic consumers are concentrated. Outside that area electricity is used mainly for lighting. Despite the loss of a substantial number of power stations, the total consumption of approximately 500 million kWh yearly compares with 300 million before the war.

The shortage of electricity is principally due to the poverty of the country and

Proposed E.B.A.S.C.O. transmission system



its low standard of living, but another contributory factor has been lack of defined policy. Under the Greek recovery plan this deficiency is to be remedied and future capital investments are to include a substantial proportion of plant earmarked for electrical construction.

The technical policy has recently been defined in a report of the American Electric Bond and Share Company (E.B.A.S.C.O.) submitted to E.C.A., which deals extensively with the whole subject of Greek electrification. It is based on several assumptions, not the least important of them being termination of the civil war and establishment of a modern mechanized lignite mining industry for the provision of fuel. The report is now subject to official consideration of the Greek Government.* Its thoroughness and soundness are of such an order as to merit extensive quotation as an example of constructive market and industrial research.

The basic proposal rests upon a recommendation to create an interconnected electric power system capable of expansion to serve practically the entire mainland of Greece. The system would be supplied from a combination of low load factor hydro-electric plants and high load factor lignite burning steam-electric plants, with low load factor oil burning steam and diesel-electric plants, for peak loads, for supplementing the hydro plants during extremely dry periods and for reserves. Oil fuel would be required for these plants in limited amounts, for diesel-electric plant at points which it is not practicable to serve from the transmission system, and for diesel-electric plants on the islands.

If adopted, the system will consist of (1) proposed Ladhon and Acheloos hydro projects; (2) proposed Salonika and Chalkis thermal plants; (3) present St. George's Bay and New Phaleron thermal plants; (4) several existing small thermal and water-power plants that can be retained; (5) future Vodas (Edessa) and future Louros hydro projects; (6) proposed 150 kV single-circuit transmission lines from power sources to load centres to form an interconnected network; (7) 15 kV primary distribution systems (except in areas where the existing established systems will be retained and expanded); and (8) 220/380 V systems to distribute supplies to consumers. The frequency will be 50 c/s, now used in Greece and practically standard for Europe. The high-voltage transmission and distribution systems would have solidly earthed neutrals.

Reserve facilities will not be provided in power plants, transmission and distribution lines or equipment, which are all to be designed for service up to their maximum load-carrying capacities. The plan of operation will require maintenance work to be carefully scheduled for off-peak periods and holidays, the service being curtailed when necessary.

Details	Estimated Cost $1,000
Part 1, to be completed in 1951 :	
Chalkis steam stations, 51,000kW... ...	16,100
Salonika steam station 17,000kW ...	6,900
Chalkis-Athens 150kV line and substations	1,700
Chalkis-Volos 150kV line and substations	4,350
Athens-Patras 150kV line and substations	3,400
Distribution systems	18,130
St. George's Bay new lignite burning boiler	2,300
Lignite barging equipment	3,800
Sub-total, Part 1	56,680
Part 2, to be completed in 1952 and 1953 :	
Ladhon hydro project, 50,000 kW ...	21,000
Ladhon-Corinth 150 kV line and substations	2,950
Volos-Salonika 150kV line and substations	4,100
Salonika-Edessa 150kV line and substations	1,650
Salonika-Drama 150kV line and substations	2,300
Trikala 150kV line and substations ...	1,100
Kalamata 150kV line and substations ...	800
Athens substation addition...	380
Distribution systems	16,740
Sub-total, Part 2	51,020
Part 3, to be completed in 1954 :	
Acheloos hydro project, 180,000kW ...	74,000
Acheloos-Lamia 150kV line and substations	2,100
Acheloos-Agrinion-Athens 150kV line and substations	4,200
Agrinion-St. George's Springs 150kV line and substations	1,000
Ladhon-Patras 150kV line and substations	2,050
Athens substation addition...	1,130
Distribution systems	6,790
Sub-total, Part 3	91,270
Grand total for 1949-1955 ...	198,970

* Official Greek comment so far available agrees with the major assumptions and suggestions of the E.B.A.S.C.O. report, except where it recommends what is thought to be too heavy a concentration of generating capacity in the Athens–Piræus area.

Market analyses have confirmed the need for substantial blocks of power for all important Greek cities and towns. The recommended development programme is of three parts, to be completed in successive stages as follows:—

The estimates are based on costs in the United States in June, 1949, with constructional costs modified to apply to Greece.

Steam plants are recommended in Part I of the programme because of the shorter time required for construction and the future necessity for thermal backing of hydro stations under low-water conditions. Furthermore, smaller sets (17,000 kW) are proposed for the reason that, under the present manufacturing conditions, they can be secured practically one year earlier than larger sizes. If this situation changes, or authorization is so delayed that 1952 is the earliest possible date for the completion of the new plants, then the recommendation for Chalkis might well be changed to two 30,000 kW sets at a total cost not appreciably different from that of three 17,000 kW units.

For Salonika the 17,000 kW size will provide enough capacity for the immediate load until the interconnection to the south has been constructed. Partial conversion of the St. George's steam plant to lignite fuel by the installation of a new boiler equivalent to 20,000 kW is recommended.

Chalkis power station will be on the Euboean Gulf, approximately 12 km (7 miles) south of the town. Major equipment will include three 17,000 kW, 600 lb/sq in (42 atm), 825 deg F (440 deg C), 50 c/s, 3,000 r.p.m., 15 kV turbo-generators served on a "unit" layout by three 200,000 lb/hr (90 tons/hr) steam boilers designed to burn pulverized Greek lignite with oil as a secondary fuel. Three 20,000 kVA, 15/150 kV transformers will deliver energy to a 150 kV bus and the transmission system.

Salonika power station will be on the Thermikon Gulf, on the north-west edge of the city. It will contain one similar 17,000 kW turbo-generator and boiler. Energy from this station will be delivered to the city distribution system at the generated voltage.

Lignite is recommended as the primary fuel because it is indigenous, will conserve foreign exchange and provide employment.

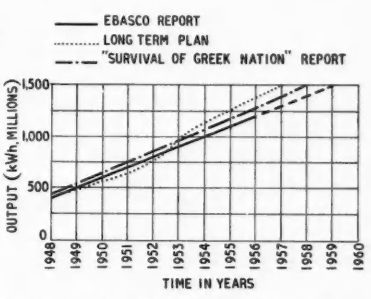
The approximate annual tonnages required for the power programme are:—

Year	1,000 Metric tons	
	Average water content	Low water content
1951-52	520	520
1952-53	540	620
1953-54	600	650
1954-55	250	450
1955-56	250	520

There has been little planned exploration, but investigations by the U.S. Bureau of Mines and U.S. Geological Survey indicate that there are 15 to 18 million recoverable metric tons of lignite available at Kimi and Aliveri alone.

Four rivers have been investigated. The Ladhon plant will consist of a dam and reservoir, a tunnel to a surge tank with penstock for two 25,000 kW reaction turbine-generators, 15 kV, 50 c/s, connected through step-up transformers in "unit" arrangement to a 150 kV bus and transmission system. The Acheloos plant will comprise a reservoir with three 60,000 kW similarly arranged machines.

It is recommended that the development of the Vodas and the Louros rivers should be deferred until probably some time after 1955. The Louros project is small and the area in which it is located can be served from the transmission system. The development of the Vodas river in connection with the control of Lake Ostrovo would be a natural source, but is complicated by several unusual problems.



Present and projected electricity outputs

The Ladhon project has been selected for early development because it will serve the Peloponnesus and the Athens areas. The Acheloos project might be constructed in four years on a high-speed basis, but it cannot be started until early in 1950 and may be delayed until 1955. All of the head obtainable would be secured by means of a dam 325ft high.

Security reasons made it impossible to conduct field investigations on the river until early in June, so that an adverse decision is possible, although one is not expected.

Single-circuit transmission lines are recommended, of long span, horizontal configuration with lightning protection, modern relaying and switching. Conventional steel construction is assumed for the cost estimates, but concrete and/or wood H-frame structures may be more economical for some sections of line.

Step-down substations will be simple standardized steel structures, in general arranged for three phases, except in certain cases where the existing systems will be retained. The low-voltage system will have a solidly earthed neutral. It is intended that radiating distribution lines shall be connected to the bus by means of automatic switching.

Primary distribution will be standardized at 15 kV and service voltages of 220/380 for all residential, commercial, rural and small industrial customers are recommended, as is now standard in Athens.

Oil Tanker Design

Steam Turbo-Electric Propulsion Favoured

THE principal factors which influence the design of ocean-going oil tankers are discussed in a paper which Mr. W. Lynn Nelson recently submitted to the Institute of Marine Engineers in London.

It is not the purpose of this paper to compare different types of ship, or propelling machinery, but the author's study suggests that a tanker capable of not only carrying but also of "handling" safely and expeditiously petroleum of all grades from most parts of the world must also be capable of generating an abnormal amount of steam for auxiliary machinery. This consideration must influence the owner seriously to consider steam propulsion.

The author shows that in a vessel of 15,000 tons, 535ft long, with a machinery space 97ft long, it is possible to accommodate either geared turbines or turbo-electric generators, the bias being towards the latter for reasons which are set out in the paper.

The second half of the paper is devoted to a discussion in some detail of Fraser and Chalmers (G.E.C.) propulsion machinery, consisting of a turbine of 9,000 s.h.p. at 3,280 r.p.m., from which steam is bled for feed heating with boilers generating at 500 lb/sq in and 800 deg F. The alternator would be of 6,930 kW at 3,320 V and 3,280 r.p.m. three-phase 51 6 c/s, with a closed circuit cooling system. The main propulsion motor would be a salient pole synchronous reversible machine of the same voltage and frequency, producing 8,300 s.h.p. at 120 r.p.m. Remotely indicating thermocouples would be embedded in the stators of both alternator and propulsion motor.

The main alternator would be excited directly from either of the auxiliary generators and the propulsion motor from the ship's mains. There would be two auxiliary steam turbo-generators of 400 kW each and one 150 kW diesel-driven stand-by set, all d.c. at 200 V.

An innovation would be a form of mixed pressure arrangement of the auxiliary turbo-generators. This balancing assembly would provide, when the auxiliary range pressure exceeded 1 lb/sq in, for a valve to open to a low-pressure stage of the turbine and for simultaneous proportionate reduction of high-pressure steam to nozzles in order to maintain the speed of the generator constant, and also constant pressure in the exhaust range. This would be a valuable asset in a tanker of this class, whose exhaust steam requirements vary considerably.

New Ontario Station

THE first two units of a 14-unit hydro-electric station at the Abitibi Power & Paper Co.'s mill at Iroquois Falls, Ontario, have been put into service. Completion of this power station, which is scheduled for next spring, will mark a further stage in the rehabilitation programme commenced at this plant in 1946.

Economical Sterilizing

Electrical Steam Raising for Clean Milk Production

By P. WAKEFORD*
A.M.I.E.E.

STEAM sterilizing is an essential feature in the production of clean milk and the use of electricity as a means of raising steam for this purpose is increasing rapidly. This has happened in spite of the comparatively high initial cost of electrical steam-raising equipment, and the obvious advantages of cleanliness and saving in labour which it offers, must have contributed largely to this increase. It is not so generally realized, however, that, properly installed and operated, it can be at least as economical to run as any other form of steam raising depending on coal, gas or oil as the fuel supply. For satisfactory and economical operation of electrical steaming equipment certain principles and factors have to be recognized and applied.

The first point always to be borne in mind is that the electrical equipment must be "matched to the job"; this means simply that for every steaming operation to be done on the farm there is a minimum rate of steam evaporation necessary to achieve satisfactory results. This can be expressed in terms of electrical loading—each kW can be regarded as evaporating 3 lb of steam per hour.

Undoubtedly the most effective steaming combination is the self-contained insulated "electric" chest with the steam generator fitted underneath, and this should be used whenever chest steaming is the main sterilizing duty. The loadings of these are usually chosen to give a sterilizing temperature in 40-55 minutes when filled with utensils. If a separate chest has to be used, however, care should be taken to see that it is insulated, and the double-walled air space form of insulation is to be preferred to solid lagging, since the latter absorbs an appreciably greater proportion of heat. It is probable that a slightly higher relative loading will be required than for a self-contained chest.

The sterilizing of clusters can be carried out by 6 kW for a set of three clusters in 3 to 4 min and the same load will steam a 10 gallon churn on a churn stool in 2 minutes. When, however, *in situ* steaming of recorder and releaser plants is involved, the loading required goes up to 15 kW for a 3-point recorder and 24 kW for the 6-point size. When these high evaporation rates are required, the storage steam raiser becomes the more practical proposition since, by storing heat, these high steaming rates can be obtained with one-tenth to one-fifth of the kW demand from the direct steam raiser, and at small extra cost in units used. Correct estimation of the quantities of steam necessary for all the operations required from the storage steam raiser then becomes a factor in achieving economy, but detailed evaluation of these is beyond the scope of this article.

The second basic principle is to examine the possible need for modification to existing layouts and methods of steaming and, of course, to ensure so far as possible correct installation and steaming methods in new sterilizing rooms. For the vast majority of farmers the most important sterilizing duty is undoubtedly in-chest steaming and the method of use of this calls for some attention. As a general rule all utensils should be steamed inside it, but where several churns are involved this would mean increasing the size of the

* Technical Assistant, Agricultural Electrification Section, B.E.A.

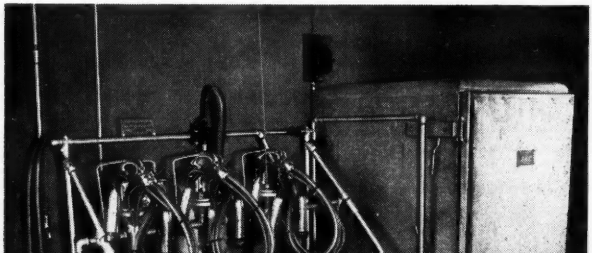
chest or steaming in batches, both of which are uneconomic and bacteriologically unnecessary. Churns can, instead, be satisfactorily steamed on a churn stool. If, for some reason, a larger size chest than is strictly necessary has to be used, a better performance is obtained if the grid on which utensils are placed is raised to bring them nearer the roof.

A 16 or 19 cu ft chest is probably the smallest practical size on the small farm. A 27 cu ft chest is usually adequate for hand milked herds of about twenty cows, and will cope with a 4-unit bucket milking plant. It will probably be necessary to go to a 36 or 48 cu ft chest for 5-8 unit bucket plants. Wherever possible a small chest should be used in preference to a large one, but future expansion of the herd should be taken into consideration also. When a farmer changes from a bucket to a recorder plant, however, it is almost certain that he will be able to get his utensils into a smaller chest as there will be no machine buckets to sterilize. It is worth considering this as appreciable economy in running cost can be achieved if he changes, say, from a 36 to a 19 cu ft size of chest.

Most farmers will want to steam clusters and churns outside the sterilizing chest, and the layout of the pipework, particularly for jet steaming of clusters, deserves some attention. On far too many farms the jets are so placed that steam is made to travel upwards from the jet to the clawpiece of the cluster. More efficient steaming is obtained if the height of the jet is raised so that steam travels downwards from jet to clawpiece, as condensate blockage is then prevented and any condensed water formed is removed more quickly. The pipework from the steam source to the jets should be short and arrangements made to drain condensate beyond the last jet. This is accomplished by sloping the jet pipeline towards a stop cock fitted at one end.

The design of the churn stool is important. The most effective sterilizing is obtained from one in which the height of the supports on which the churn rests does not exceed $\frac{1}{4}$in. In sterilizing churns in this way timing is most important and use should be made either of a 2-minute sand glass or the seconds hand of an electric clock fitted in the dairy. It should not be left to guesswork, and the traditional method of testing temperature by hand offers no criterion at all.

A great deal of steam can be wasted in steaming recorder and releaser plants carelessly. There are two types of plant, and each requires its own technique. In one (e.g., the Alfa Laval) steam has to pass through the recorder jar before it can reach the teat cup clusters. With this type, too, filling jars and flushing clusters with hot water for the washing process, followed by steam injection of the hot water in the jars for the sterilizing process is sometimes advocated. This is unnecessary and flushing throughout with hot water followed by steaming, is perfectly satisfactory. Steaming by this method presents no particular difficulty, except that it is wiser to admit steam to each jar individually, beginning at the unit nearest the steam supply. This allows progressive removal of condensate and hastens steaming.



Modern self-contained G.E.C. electric chest with Gascoigne "Auto-washer."

In the second type of recorder plant (e.g., the Gascoigne), steaming is normally so arranged that steam passes into clusters and jars at the same time, so that the latter take longer to sterilize than is necessary. By suitable settings of the master valve, however, it is possible instead to steam the clusters and jars separately and thus save steam. By this method the clusters are allowed to steam freely for 3 minutes, the setting is altered, and the jars are then sterilized.

While it is not possible to cover in a short article the wide variation in steaming requirements and installations in the dairy farming industry, it will have served its purpose if those electrical engineers to whom dairy sterilizing is a new subject are able to appreciate the responsibility devolving upon them in advising on and installing farm electrical sterilizing equipment.

PORTUGUESE ELECTRICAL IMPORTS

Great Britain's Increased Share

LAST year Portugal's electrical imports continued to increase although not at the same rate or as uniformly as in 1947. The principal items are shown in the accompanying table with notes of increases or decreases compared with 1947. Britain's improved share in the increased trade in power plant, wires and cables (except the smaller diameters) and complete telephone installations was noteworthy. Imports of radio apparatus declined except from Britain. (Approx. 100 escudos=£.)

Class of Equipment	1948 Escudos (000)	Inc. or dec. on 1947 Escudos (000)
Accumulators and condensers weighing per cell less than 8 kg.	11,416	+ 1,334
From Sweden	275	− 205
,, *United States*	2,629	− 3,961
,, *Spain*	923	+ 498
,, *Switzerland*	132	+ 16
,, *Britain*	5,479	+ 3,003
Other elec. accumulators and condensers and parts	5,265	− 154
From Spain	924	+ 393
,, *United States*	1,371	− 975
,, *Britain*	2,182	+ 646
Batteries, dry	2,441	− 343
From United States	944	− 298
,, *Britain*	654	+ 144
,, *Holland*	344	+ 300
Batteries, other	90	+ 44
From Britain	61	+ 24
Loudspeakers	2,083	− 925
From United States	818	+ 1,479
,, *Britain*	717	+ 459
,, *Holland*	372	+ 264
Radio apparatus	47,498	− 18,099
From Britain	12,224	+ 3,930
,, *United States*	18,662	− 17,482
,, *Sweden*	2,850	− 1,458
,, *Holland*	10,238	− 1,070
Vacuum cleaners	3,836	− 633
From Sweden	2,357	− 289
,, *Britain*	1,027	+ 272
Insulated wire or cable, textile covered, weighing up to 120 gr. per metre	2,253	− 2,412
From Britain	1,519	− 823
,, *United States*	413	− 363
,, *Sweden*	195	− 127
Ditto, weighing over 120 gr. per metre	17,550	+ 2,326
From Britain	11,251	+ 895
,, *Holland*	4,577	+ 3,980
Ditto, with other insulation and metal protected	75,398	+ 55,042
From Britain	51,515	+ 39,638
,, *Belgium*	11,122	+ 7,397
,, *Spain*	2,207	*
Lamps for lighting or heating ...	8,580	− 4,196
From United States	3,616	− 720
,, *Holland*	2,782	− 3,699
,, *Britain*	827	+ 317
Lamps, other electric	7,784	− 2,513
From United States	4,447	− 4,438
,, *United Kingdom* ...	1,724	+ 1,125
Telephone apparatus	8,137	− 3,129
From United States	336	− 1,045
,, *Britain*	6,573	− 726
,, *Sweden*	434	− 1,386
Telegraph apparatus	1,870	*
From United States	471	
,, *Britain*	1,400	
Complete installations for telephone exchanges (not including telephones, accumulators or dynamos)	43,567	+ 7,384
From Britain	31,770	+ 11,486
,, *Sweden*	8,475	− 6,999
Generators, motors, transformers and parts weighing up to 100 kg.	53,185	+ 2,912
From Belgium	5,060	− 165
,, *United States*	14,849	− 1,316
,, *Switzerland*	7,026	− 1,247
,, *Sweden*	2,085	+ 83
,, *Britain*	17,288	+ 4,859
Ditto, weighing 100 to 500 kg. ...	24,910	+ 6,284
From Britain	8,706	+ 7,356
,, *Belgium*	5,178	+ 2,750
,, *Switzerland*	2,795	+ 1,532
,, *United States*	3,571	+ 745

* Comparable figures not available.

COALFIELD ELECTRIFICATION

Yorkshire Reorganization Scheme

ONE of the major schemes of colliery reorganization in the North Eastern Division of the National Coal Board is now taking shape at Manvers Main Collieries, Wath-on-Dearne, nr. Rotherham, where for many years coal has been wound from four pits. When the reorganization is completed the output will be wound at only two of the shafts, at Barnbrough and Manvers Main Collieries.

The surface reorganization involves electrification of the winding engines and the erection of a central preparation plant to deal with 12,500 tons of coal a day. The underground reorganization calls for the provision of locomotive haulage and large mine cars.

Winding Gear

Seven winders will be electrified. Two at Manvers, a.c. direct driven, are likely to impose on the Yorkshire Electricity Board's system a peak of some 4,800 h.p. if both winder peaks coincide. The Y.E.B. has asked the manufacturers to incorporate some arrangement to limit the demand in the first few seconds of the wind so that supply to other consumers of the Board, particularly the miners' domestic supply, will not be affected.

Mining a.c. winders of this size, 2,150 h.p. (r.m.s.) and 1,450 h.p. (r.m.s.) have not before been accepted for connection to the system. It has generally been necessary to recommend the installation of Ward-Leonard unequalized or fully equalized equipment to limit the acceleration period and the maximum demand.

The winder for Barnbrough, which is now being installed, is probably the largest in the country and is unique in that it is one of a batch of three manufactured in America in 1944 to the order of the Soviet Government, but never delivered. All three were offered to the British Government at a much reduced price and the N.C.B., North Eastern Division, purchased this one which it is hoped may be in commission about August this year.

For purposes of identification it can be classed as a Ward-Leonard unequalized equipment. The 3,000 V synchronous motor is rated at 3,500 h.p., weighs 20 tons and drives two 1,250 kW 600 V motor-generator sets which, in turn, supply d.c. to two 1,750 h.p. motors driving the 20ft diameter drum. This drum winds coal from a depth of 750yd by means of a skip holding 8 tons with a wire rope of 1⅞in diameter. The drum shaft is of 3ft 2in diameter at its widest part, 40ft 6in long, and it weighs 55 tons.

The central coal preparation plant will also be one of the largest in the country, designed for a throughput of 1,200 tons an hour which includes all the run of mine coal. The total output (12,500 tons a day) will be concentrated at Manvers by underground locomotive haulage from Wath to Manvers and from Kilnhurst to Manvers, but will be brought overland by rail from Barnbrough to Manvers in specially designed wagons holding 25 tons each.

The electrical installation of the coal preparation plant totals 7,000 installed h.p. and because coal will be wound on two shifts it will be running 15 hours a day.

The Yorkshire Electricity Board is to establish a 66 kV substation at Barnbrough which initially will provide 4,000 kVA to Barnbrough Colliery with further points of supply from the Board's system at Manvers Main of 11,000 kVA; at Wath of 2,500 kVA and 3,000 kVA at Kilnhurst, making a total of 20,500 kVA.

With the provision of 3,000 kVA for adjacent coke ovens and when the existing generating plant is shut down at Barnbrough in the near future a further 3,000 kVA will be needed, making in all 26,500 kVA for this complete scheme of centralization.

News from France

MONSIEUR GIGUET, director of equipment of Electricité de France, has stated that present credits will scarcely allow work now in progress to be carried out at a normal rate. As from 1952, difficulties are likely to be accentuated. He pointed out that marginal production cost was still higher than the sale price of electricity, and indicated that a certain "elasticity" might be introduced in the tariffs.

A number of unions and federations have combined to create a National Association of Electricity Consumers to represent industry and commerce, and it aims to "inform, represent and defend." It will circulate information to industrialists and establish a permanent contact with the Administration and Electricité de France.

Canadian Imports

Forthcoming Relaxation in Exchange Conservation

By JOHN C. HANCOCK

WITH a view to encouraging the import of goods from "soft" currency countries, the Canadian authorities recently announced some important relaxations in the operation of their Emergency Exchange Conservation Act.

In view of the need for the United Kingdom to increase its dollar earnings, electrical exporters will welcome any move likely to assist in bringing this about. Appended to these notes is a list of electrical products coming within the scope of the Act and tabulated so as to form a concise guide to exporters intent on increasing their Canadian business. "Near" electrical goods, such as electrically operated adding machines, etc., have been omitted in order to confine the list to electrical goods proper.

Exporters will notice some outstanding amendments due to operate on 1st July next. These relate to electric refrigerators, washing machines, ironers and dishwashers, etc., all of which, until that date, are on the prohibited list. These goods will then be allowed unrestricted entry into Canada, provided they originate in "soft" currency countries, including the United Kingdom.

The three months' grace will not only give manufacturers an opportunity of getting their models approved by the Canadian Standards Association, but will also afford opportunities of appointing agents to handle new lines.

As is implicit in its title, the Act is designed to conserve Canadian foreign currency reserves and to this end imports have been grouped under three main headings. These are:—

Schedule I.—Prohibited List, comprising all goods whose importation is prohibited from any country.

Schedule II—Quota Goods, covering goods which are not subject to import restrictions when originating in, and imported from, the so-called "soft" currency countries. The quota arrangements apply only to goods originating in "hard" currency countries.

Schedule III—Capital Goods: These are subject to import control. Applications for import permits must be made by the importer in Canada to the Canadian Import Branch, Ottawa. Reference to this list indicates the type of goods covered by this schedule: they may be imported, provided licences are granted, from *any* country.

Generally, goods not mentioned in the Act are not affected by these regulations, though exporters would be well advised to treat this statement with a certain amount of reserve. When in doubt, they should refer any queries to the Canadian Customs representative, Canada House, Trafalgar Square, London, S.W.1.

Amendments to this list will be notified in the *Electrical Review* from time to time, in order that exporters may keep their lists up to date. The schedules are as follows:—

CANADIAN EMERGENCY EXCHANGE CONSERVATION ACT

Comprising all impending amendments up to and including 1st July, 1950.

SCHEDULE 1—PROHIBITED LIST

Tariff Item No.	Description
ex 445	Electric light fixtures and appliances, n.o.p. (not including industrial electric light fixtures, or parts).
ex 445e	Dry cell batteries, n.o.p.
ex 465	Electric signs of any material.
ex 711 *ex* 362c *ex* 427 *ex* 446a *et al*	Air conditioning units and apparatus designed for household or office use. Radio cabinets finished or unfinished.

SCHEDULE 2—QUOTA GOODS

Tariff Item No.	Description
ex 415	Vacuum cleaners and attachments therefor.
415a	Refrigerators, domestic or store, completely equipped or not (*effective,* 1.7.50).

ex 415b	Washing machines, domestic, with or without motive power incorporated therein, (*effective* 1.7.50).
ex 427h	Motion picture projectors for use with films less than 1⅛in in width, with or without sound equipment, and motion picture screens adapted for use therewith.
ex 443	Apparatus designed for cooking or for heating buildings (not including parts).
ex 519a	Carpet sweepers.
444b	Lamp shades, n.o.p., and shade holders.
ex 445a	Electric flashlights (excluding batteries).
ex 445b	Incandescent electric lamps (*effective* 1.4.50).
ex 445d	Radio receiving sets and chassis therefor (*effective* 1.7.50).
ex 445i	Electric sad irons (smoothing irons).
ex 445j	Electric dry shaving machines.
ex 711 *ex* 362c *ex* 427 *ex* 466a *et al*	Domestic water heaters; public address and communication systems; Beverage dispensing and mixing equipment; Christmas tree decorations of all kinds, including lights and fittings therefor. Electric heating pads and blankets; hair waving and drying machines; electric fans; floor polishers; door chimes.
	*Electric mixers, ironers and dishwashers, designed for household use: domestic garbage disposal units; pencil sharpeners (*effective* 1.7.50).

** Awaiting confirmation of telegraphic advice from Canada.*

SCHEDULE 3—CAPITAL GOODS

Tariff Item No.	Description
ex 415	Complete parts of electric and hand vacuum cleaners and of attachments therefor for production use.
ex 415b	Complete parts of washing machines, domestic for production use.
ex 427	All machinery composed wholly or in part of iron or steel, n.o.p.; complete parts thereof for production use.
ex 427a	All machinery composed wholly or in part of iron or steel, n.o.p., of a class or kind not made in Canada; complete parts of the foregoing for production use.
ex 427h	Motion picture projectors for use with film 1⅛in in width or over; electric rectifiers or generators designed for use with such motion picture projectors; arc lamps for motion picture work, motion picture or theatrical spot lights, light effect machines, not to include electric light bulbs, tubes or exciter lamps; complete parts for production use of motion picture projectors, arc lamps for motion picture work, motion picture or theatrical spot lights, light effect machines, motion picture screens, portable motion picture projectors, with or without sound equipment, and electric rectifiers or generators designed for use with motion picture projectors.
ex 428e	Diesel and semi-diesel engines, n.o.p.; complete parts thereof for production use.
ex 445	Complete parts of electric light fixtures and appliances, n.o.p.
ex 445d	Complete parts of radio apparatus, n.o.p.
ex 445f	Electric dynamos or generators and transformers, n.o.p.; complete parts thereof for production use.
ex 445g	Electric motors, n.o.p.; complete parts thereof for production use.
ex 445i	Complete parts for the production of electric sad irons.
ex 445j	Parts for the production of electric dry shaving machines.
ex 445k	Electrical apparatus, n.o.p.; complete parts thereof for production use.
ex 446	Electric steam turbo-generator sets, 700 h.p. and greater, of a class or kind not made in Canada; complete parts thereof for production use.
ex 446g	Electric or gas apparatus designed for welding or cutting, not including motors; parts thereof for production use.
	Certain materials and components used in the manufacture or repair of various classes of machinery also come within the category of "Capital Goods", notably items used in the manufacture or repair of the following (reference should be made to the official Canadian Customs tariff for full details):—
438 and sub-items	Automobiles and parts therefor; electric traction vehicles and parts therefor, etc.
440 and sub-items	Marine craft, aircraft, etc.
4450	Radio apparatus, etc., and musical instruments.

NOTE: Where a tariff item is listed without being preceded by the prefix "*ex*" all goods included in that tariff item are deemed to be included in these schedules, and where a tariff item is listed and preceded by the prefix "*ex*" only the goods described thereafter are deemed to be included in the schedules.

Progress in Victoria

THE thirtieth annual report of the State Electricity Commission of Victoria points out that the amount of electricity sold in the year to 30th June, 1949, was a record of 1,725 million kWh. Supply was extended to 16,877 new consumers of whom nearly 11,000 were outside the Melbourne area.

Total revenue in 1948-49 from all operations was £8,805,818, and expenditure £8,879,517, giving a net loss on operations of £73,699, which was met from reserve funds. Additional expenditure arose mainly from increased wages and the need to purchase substitute fuels. A record expenditure of nearly £16 million is budgeted for the 1949-50 capital works programme. (compared with a capital expenditure of £6¼ million in 1948-49).

During the year some 800 British emigrants arrived on group nomination to the State Electricity Commission.

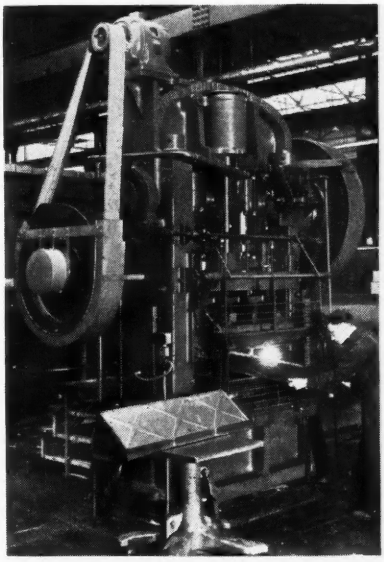
Cooker Manufacture in Scotland

Increased Production at Motherwell

THE establishment at Newarthill, Motherwell, in 1931, of the British National Electrics factory for the manufacture of electric cookers, fires, water heaters and other appliances marked the introduction of the first of the light industries into the Mid-Lanarkshire area.

The original production was confined to floor-type cookers, breakfast cookers and a range of fires. Irons and toasters were soon added, and in 1935 two associated companies were formed—Archibald Low Electrics, Ltd., to handle water-heating equipment, and the J. P. Tubular Heater Co., Ltd., to deal with tubular heaters and other space-heating equipment.

The manufacture of irons and toasters was discontinued in 1939, since when the company has been concentrating on a range of cookers, water heaters, fires and tubular heaters. Following the absorption of the company and its associates by Johnson & Phillips, Ltd., four years ago, B.N.E. became the Domestic Appliances Section of J. & P., and production of the "Charlton" range of water heaters was transferred to Newarthill.

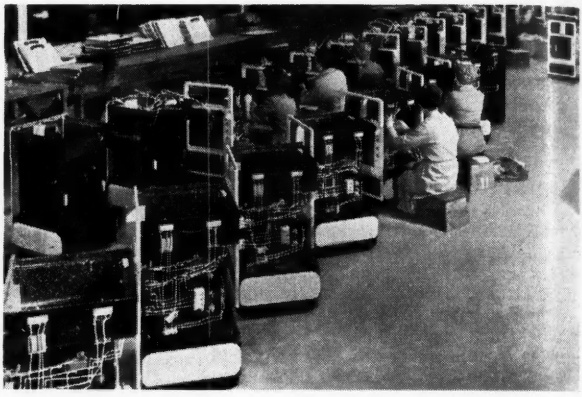


Pressing the oven side plates for the cookers

Part of the well-equipped machine shop

Unfortunately the heavy purchase tax on water heaters and fires and the quota restrictions have prevented the expansion of these two items as had been hoped and production has proceeded on a very limited scale.

On the other hand the success of the new C.49 cooker, has lately necessitated an almost complete reorganization of production methods. Much new plant has been installed, and the number of employees increased to about 500—approximately 200 more than ever engaged previously on domestic appliance work, though not so many as were needed when the company was busy on war work. There still remains adequate space in the 120,000 sq ft factory for the laying out of extensive production lines for water heaters and fires when conditions permit.



Fitting the previously jigged, cut and assembled wiring harnesses

To cope with the demand for the new cooker and at the same time keep abreast of orders for other products it has recently been necessary for the press shop, shot blasting and vitreous enamelling sections to work day and night, a partial night shift also being worked by the machine shop. Additional plant, including heavy presses, is at present being installed to deal with the situation.

The main factory is divided into three major sections: machine shop, assembly bay, and test and despatch bay. The assembly bay is fed with vitreous enamelled parts from the adjacent ovens, and with sub-assemblies for cookers and water heaters from the sub-assembly bays. All these components pass through an inspection bay before reaching the assembly lines.

The main structure of the C.49 cooker, which comprises the hot-cupboard, oven and base units all bolted to a cast-iron front frame, is assembled on a roller conveyor or system. Next, the exterior panelling is fitted with the exception of the right-hand side, and the cooker is lagged and fitted with doors, the drop-down oven door being bedded to tissue-paper tolerance.

The whole of the wiring, which has previously been jigged, cut and assembled, is added as a complete harness, and the cooker is then complete except for the remaining panel and the hob equipment. At this stage it receives a final inspection before being completed and passed to the test department. Each cooker is thoroughly tested, including a 1,000 V flash test, before being packed ready for dispatch to customers.

Flow production methods have been adopted

A batch of type C.49 cookers undergoing final test before dispatch

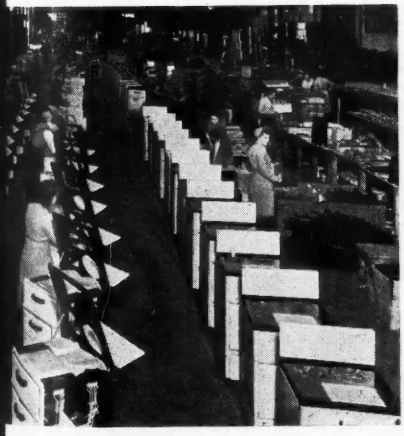
Similarly well-organized assembly lines produce the water heaters—many of which are for export—and breakfast cookers. The latter is one of the company's oldest and most popular lines, finding a ready demand for use in small flats, etc.

One of the most interesting operations in the water-heater section is the stove enamelling, where a continuous overhead conveyor system carries the enamelled components through modern infra-red drying ovens.

Light assembly work in connection with such items as immersion heaters, heating elements, fires, convectors and tubular heaters is carried out by operatives on the first floor of the Cambuslang factory.

Also situated on this floor are a development section where new ideas and improvements and modifications to existing designs are dealt with; a department where special tests are carried out and a kitchen where cookers can be tested under their actual operating conditions.

for the main cooker assembly department



Code of Practice

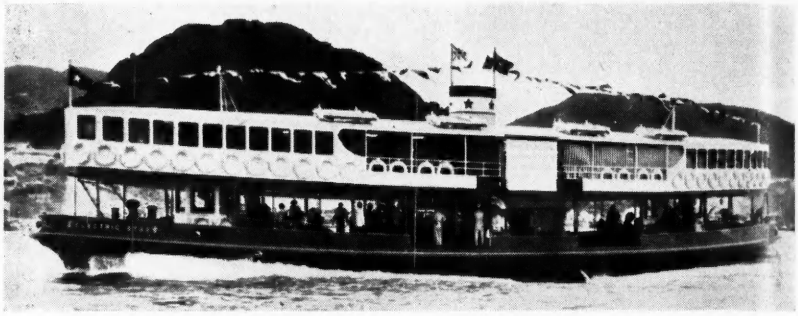
THE Council for Codes of Practice has just issued in final form Code 321.102, "Installation and Maintenance of Electrical Machines," which deals with rotating machines, transformers, rectifiers, capacitors and associated equipment operating at 650 V or less and installed on the consumers' side of the supply terminals. A list of relevant British Standards is included and information is given regarding the protection of apparatus, circuits and conductors against the risk of fire and other hazards.

Methods of protecting motors and their circuits against excess current are discussed and recommendations made with reference to starting current, the grouping of f.h.p. motors, the protection of power factor correction apparatus and efficient control.

The section dealing with work on site sets out the factors which should govern the siting and installation of apparatus, and specifies the necessary precautions against fire risk from oil-filled switchgear and transformers. Guidance is given in safeguarding personnel, together with information and advice on the inspection and testing of installations; maintenance of machines, switchgear and oil-filled equipment; on the protection of exposed surfaces; and on periodical checks on earthing and safety systems.

There is also an appendix consisting of tables with explanatory notes giving current readings of cables used with motors working under special conditions.

Copies of this Code are available from the British Standards Institution, 24-28, Victoria Street, London, S.W.1, price 4s postage free.



Diesel-Electric Ferry Vessel

Re-equipment of the "Electric Star"

TWO diesel-electric marine propulsion equipments, complete with auxiliaries, were recently supplied to the Star Ferry Co., Hong Kong, by the Metropolitan-Vickers Electrical Co., Ltd. One of these has been installed in the 17-year-old, 116ft, double-ended passenger ferry *Electric Star* which is now in regular service between Hong Kong and Kowloon. The vessel's machinery had been removed during the Japanese occupation of Hong Kong and it was severely damaged.

The propulsion equipments are of a modified Ward-Leonard type and have features which are not easily provided by any other system. First, the main generators are so designed that the maximum current generated, even on short circuit, is only twice normal full load current. The power generated, and, therefore, the load on the engines, reaches a maximum at a point just above normal full load. If the load on the propellers increases beyond this point, the power generated falls until the motors are stalled when the power is only negligible, it thus being impossible to overload the engines under any conditions. Secondly, when the vessel is travelling in either direction the propeller at the after-end drives the vessel, while the bow propeller turns at about 60 per cent of the speed of the driving propeller, in which condition it exerts no torque and produces minimum water disturbance.

The two main propulsion units and the auxiliaries are grouped in three separate watertight compartments. The centre one houses the main generating sets and auxiliary control equipment, stand-by generator, motor-driven air compressor and starting air-bottles, etc., while the others contain the propulsion motors, each directly coupled to a propeller, and also fresh water and fuel oil storage tanks.

The two Metrovick propulsion motors, which are of the disc lubricated type, and complete with Michell thrust blocks, ventilating fan, and tachometer generator, are rated at 370 s.h.p. at 250 r.p.m. when taking 625 A at 475 V. They can sustain a continuous overload of 420 s.h.p. taking 690 A at 490 V without injurious heating.

Power for propulsion is supplied by two 158 kW generators, each of which is driven by a 12-cylinder Davey Paxman vee-type diesel engine, developing 310 h.p. at 1,000 r.p.m. A 50 kW generator, coupled in tandem to each main generator, provides power for auxiliaries, excitation of the main generators and lighting.

On each main generator is mounted a switching cubicle housing the isolating switch, field control switch and resistances. Control over the motors is exercised from the engine room control desk, but can readily be transferred to a controller on either bridge. When one of these is in use the other is locked and cannot be operated. This provides flexible and rapid control of the propellers during manœuvring. Mechanical reply telegraphs by A. Robinson & Co. are provided for use when the vessel is on engine room control.

The switchboard controlling the auxiliary supply is in the engine room at the side of the control desk and comprises two auxiliary generator panels, a stand-by generator panel, and a distribution panel. There is also a 20 kW stand-by diesel generator set for harbour use.

Other equipment includes two electric

capstans by Clarke Chapman & Co., rotary "Centrex" bilge and circulating pumps, and "Wee Mac" oil fuel transfer pumps supplied by Drysdale & Co. The engine room and propulsion motor ventilating fans were made by Keith Blackman & Co., and all the cables in the installation were supplied by British Insulated Callender's Cables.

The upper deck is lighted by Metrovick fluorescent lamps, designed to give uniform lighting throughout the passenger space. The total rating of the fluorescent lighting installation is just under 1,200 W and this is supplied by two 2 kVA motor-alternators.

NEW BOOKS

Electrical Transmission of Power and Signals. By E. W. Kimbark. Pp. 461; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 60s in U.K.

In these days of over-specialization it is pleasing to find a text-book in which the transmission of electrical power and the transmission of signals by wire or wave guide are treated together as applications of the same basic transmission line theory. Such a treatment is logical and also practical, particularly in the study of power line carrier and inductive interference where a knowledge of both power and communication problems is required.

Apart from this unified treatment the subject-matter of the book is conventional and includes chapters on line characteristics, steady-state phenomena, transient phenomena, power transmission, impedance matching, voice-frequency transmission, radio-frequency transmission lines, filters, skin effect and wave guides. Copies of Woodruff's invaluable charts of the hyperbolic functions are included, and there are also appendices giving transmission line characteristics largely culled from the Westinghouse *Electrical Transmission and Distribution Reference Book*. A bibliography and a set of problems, without answers, are appended to each chapter.

The subject is clearly and accurately presented and the treatment is well-balanced, although the information on underground power cables and on "bundle" conductors is rather scanty. The mathematics is developed by easy stages and M.K.S. units are used. The historical background is weak however. For example, Kelvin is not mentioned in connection with the first Atlantic cable, and Heaviside and Poincaré are not mentioned at all. On the whole it is an excellent text-book which, except for the high price, should be much appreciated by students.—J. S. F.

Financial Control for the Small Manufacturer. By Francis Simmonds, F.C.W.A. (Pp. 96 and appendices). Jordan & Sons, Ltd., 116, Chancery Lane, London, W.C.2. Price 15s.

This book sets out in simple non-technical terms the conditions which small manufacturing concerns must observe if they wish to continue in business. Every aspect of finance is considered and each chapter ends with a "key point" check. The appendices suggest forms of records and accounts.

Industrial High-Frequency Electric Power. By E. May, B.Sc., A.C.G.I., M.I.E.E. Pp. 355; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 32s.

This book is based on a course of lectures delivered by the author at the Birmingham Central Technical College and is intended to serve as an introduction to the field of industrial high-frequency technology. The first chapter comprises a summary of the basic circuit theory, an understanding of which is essential for those wishing to study the subject generally. The various means of generating h.f. currents are described in the next four chapters; arc and spark oscillators, high-frequency alternators, the triode valve and the class B and class C operation of power amplifiers with tuned loads. The author has succeeded admirably in setting out the essentials of an extremely complex subject with the minimum of mathematics so that it can be followed by those with only an elementary knowledge of electronics and h.f. techniques.

The remainder of the book deals with the various methods and types of equipment employed in both dielectric and in-

duction heating, the industrial applications of the process and some of the operating problems which are encountered. There is also an excellent chapter dealing with auxiliary equipment and h.f. measurements.

Mr. May's work should adequately fill the present need for a volume dealing not only with the theory behind high-frequency heating, but also with the more practical industrial applications. It can be thoroughly recommended to both students and engineers.—R. P.

Glass-to-Metal Seals. By J. H. Partridge, D.Sc., Ph.D., F.S.G.T. Pp. 238; figs 167; index. Society of Glass Technology, "Elmfield," Northumberland Road, Sheffield, 10. Price 35s.

This encyclopædic volume contains a more complete and up-to-date account than any of the existing handbooks on glass blowing or laboratory techniques, either British or American. For this reason and because of the increasing use of high vacua in research and industry, Dr. Partridge's volume will find a large and eager audience. It is therefore unfortunate that there are some important errors and omissions in the book. An instance of this is the remark on p. 110 referring to matched cylinder seals in Ni-Fe alloy, Kovar, etc., that "the metal is tapered to an edge not exceeding 0.1 mm in thickness." The matched seal is important precisely because the metal need not be tapered as in a copper-glass seal.

The range of glasses whose properties are discussed is restricted to the products of a few big manufacturers. This means that no mention is made of, for instance, "Ko-dial"; one of the best of the Kovar sealing glasses. The information on the cleaning and preparation of metal prior to sealing is not very complete. A technique of much promise, which is not mentioned, is the soldering of metal to ceramics using titanium hydride as a flux. My impression is that the book is too much devoted to the technique of a single laboratory and has not achieved the breadth that one would hope for.

However, in spite of these criticisms, it should be stressed that Dr. Partridge has produced an extremely valuable compilation of information which will be of interest to anybody concerned with high vacua or hermetic sealing.—A. H. B.

Books Received

Electron Tube Circuits, by S. Seely. Pp. 529; figs. and index. McGraw-Hill Publishing Co., Ltd., Aldwych House, Aldwych, London, W.C.2. price 51s in U.K.

Éléments de Calcul Tensorial. By A. Lichnerowicz. Pp. 216. Libraire Armand Colin, 103, Boulevard Saint-Michel, Paris, Ve. Price fr.180.

Electric Wave Filters. By F. Scowen, B.Sc. Second edition. Pp. 188; figs. 71; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 18s.

Pocket Book of Refrigeration and Ice Making. Edited by the late A. J. Wallis-Tayler, enlarged by G. Gerard, A.M.I.E.E. Ninth edition. Pp. 242; figs. 37; index. The Technical Press, Ltd., Gloucester Road, Kingston Hill, Surrey. Price 9s.

Power System Interconnection. By H. Rissik, B.Sc., A.M.I.E.E. Second edition. Pp. 239; figs. 99; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 25s.

Industrial Electronic Control. By W. D. Cockrell. Second edition. Pp. 385; figs. and index. McGraw-Hill Publishing Co., Ltd. Price 34s in U.K.

Electrical Engineering Economics. By D. J. Bolton, M.Sc., M.I.E.E. Third Edition. Pp. 292; figs. 15; index. Chapman & Hall. Price 25s.

Alternating Current Motor Windings. By H. Hopwood. Pp. 320; figs. 184; index. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 25s.

Electric Wiring (Domestic). Edited by E. Molloy. Fourth edition. Pp. 248; figs. 180; index. George Newnes, Ltd. Price 7s 6d.

Newnes Electrical Pocket Book. Edited by E. Molloy. Tenth edition. Pp. 383; figs. and index. George Newnes, Ltd. Price 7s 6d.

Electrical Equipment of Automobiles. By S. Parker Smith, D.Sc., M.I.E.E. Fifth edition. Pp. 331; figs. 141; index. Chapman & Hall, Ltd. Price 12s 6d.

NEXT WEEK'S EVENTS

Monday, 17th April

BIRMINGHAM. — Birmingham Electric Club. "A Layman looks at Long-distance Transmission and its Possibilities," by the Earl of Verulam.

LEEDS.—Lighting Service Bureau, 24, Aire Street. I.E.S. Leeds Centre. Annual general meeting, followed by presidential address by J. N. Aldington.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "Private Generation and the Public Supply," opened by A. N. Irens.

NEWCASTLE-ON-TYNE.—Royal Station Hotel, 6.15 p.m. I.E.E. North-Eastern Centre. Annual general meeting, followed by a conversazione at 7 p.m.

STOKE-ON-TRENT.—M.E.B. Showrooms, 7 p.m. I.E.E. North Staffordshire Sub-Centre. Annual general meeting. "The Economical Utilization of Electricity in Great Britain," by R. B. Giles.

Tuesday, 18th April

BELFAST.—Queen's University, 6.45 p.m. I.E.E. Northern Ireland Centre. "The Performance of the British Grid System in Thunderstorms," by Dr. J. S. Forrest.

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. Lecture on "The Structure, Electrical Properties and Applications of the Barium-Titanate Class of Ceramic Materials," by Prof. Willis Jackson.

GLASGOW.—Royal Technical College. I.E.E. Scottish Centre. Faraday Lecture on "Radar," by Dr. R. A. Smith.

LEEDS.—Y.E.B. Offices, 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. "The Detection by Oscillographic Methods of Winding Failures during Impulse Tests on Transformers," by E. C. Rippon and G. H. Hickling.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. Discussion on "Temperature Measurement," opened by J. A. Hall and C. R. Barber.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "Electricity in Agriculture," by C. A. Cameron Brown.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Utilization Group. "Technical Considerations Affecting the Development and Design of Electrical Control Gear for Machine Tools," by A. R. H. Thorne.

Wednesday, 19th April

BOURNEMOUTH.—Grand Hotel, 6.30 p.m. I.E.E. Southern Centre. "Electricity in the Cotton Industry," by F. W. Cox and W. E. Swale.

EASTBOURNE.—Grand Hotel. Electrodepositors' Technical Society. Silver Jubilee Conference. (Continued to 22nd April.)

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. Three papers on "The Design and Construction of a Power Station."

MANCHESTER.—Engineers' Club, 7.30 p.m. A.S.E.E. Manchester Branch. "Electric Vehicles," by A. J. Bryan.

SHEFFIELD.—Grand Hotel, 6.15 p.m. I.E.E. Sheffield Sub-Centre. "Tidal Power and the Severn Barrage," by H. Headland.

Thursday, 20th April

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "The Works Chemist-Metallurgist and His Technique," by G. H. Burnell.

LEICESTER.—E.M.E.B. Demonstration Theatre, 6.30 p.m. I.E.S. Leicester Centre. "Black Light and Its Applications," by H. R. Ruff.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Forty-First Kelvin Lecture. "Phase-Boundary Potentials and Their Significance in Chemistry," by Professor E. K. Rideal.

Connaught Rooms, Great Queen Street, W.C.2, 12.30 for 1 p.m. Diesel Engine Users' Association. Annual luncheon.

London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers. "U.H.F. Propagation and Characteristics," by D. W. Heightman.

NEWCASTLE-ON-TYNE.—At the Literary and Philosophical Society, Westgate Road, 7 p.m. I.E.E. North-Eastern Centre. Faraday Lecture on "Radar," by Dr. R. A. Smith.

Friday, 21st April

BRISTOL.—Grand Hotel. I.E.S. Bath and Bristol Centre. Presidential address by J. N. Aldington, and luncheon.

LONDON.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. British Electrical Development Association. Annual luncheon, followed by annual general meeting.

Connaught Rooms, W.C.2, 6 for 6.30 p.m. Association of Supervising Electrical Engineers. Annual dinner and re-union.

39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. Extraordinary general meeting, to be followed by film, "Welded Structures."

Saturday, 22nd April

LONDON.—I.E.E. London Students' Section, 10.30 a.m. Visit to D.S.I.R. Road Research Laboratories, Langley, Bucks.

EXHIBITIONS

17th-19th April

LONDON.—Grosvenor House, W.1. Radio and Electronic Component Manufacturers' Federation. Exhibition of components.

18th-29th April

MANCHESTER.—City Hall, Deansgate. Manchester Building Trades Exhibition.

British Association Meeting

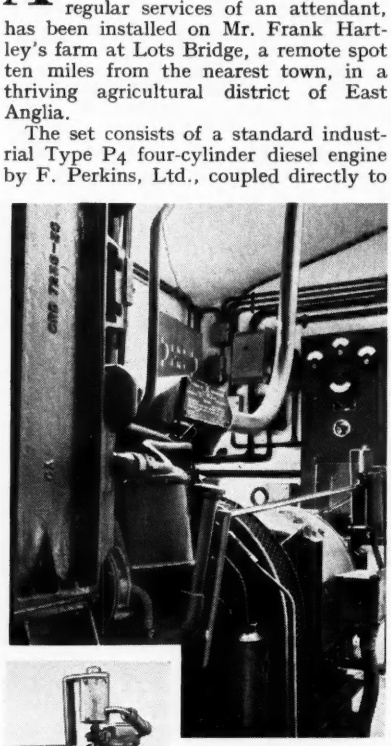
The annual meeting of the British Association for the Advancement of Science will be held in Birmingham from 30th August to 6th September next.

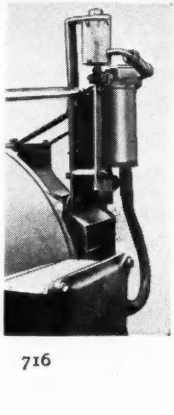
Farm Generating Plant

Automatic Diesel-electric Installation

AUTOMATIC oil-electric generating plant, which does not require the regular services of an attendant, has been installed on Mr. Frank Hartley's farm at Lots Bridge, a remote spot ten miles from the nearest town, in a thriving agricultural district of East Anglia.

The set consists of a standard industrial Type P4 four-cylinder diesel engine by F. Perkins, Ltd., coupled directly to a three-phase alternator by Mawdsley's, Ltd., compensated and self-exciting, of 25 kVA at 400/230 V and 1,500 r.p.m. The engine is cooled by a water radiator in front of which is mounted an oil cooler. The radiator fan is of the pusher type to direct the heated air away from the engine and generator instead of across them.





Solenoid and operating rod for automatically stopping the diesel engine, and (left) close-up detail view of fuel controlling solenoids

Electricity is required on this farm not only for lighting and heating, but also for the operation of refrigerating equipment, for pumping water and for power in an engineer's shop which contains a 200 A electric welder in addition to the usual workshop machinery.

To ensure that operation will be economic, long periods of running at light-load which might otherwise occur are avoided by the following working arrangements. A number of push-button switches to start the engine from a distance have been installed in widely separated positions at which power will be needed. They are so arranged that electric starting can be initiated only when the engine is stationary, or nearly so, with the aid of an engine-oil pressure switch that closes only when the fuel pressure is zero.

One of these starting switches is actuated by the refrigerating plant thermostat, to start the engine if it does not happen to be running when the thermostat cuts in.

With so many possible calls for starting the generating plant, it was not considered practicable to stop the engine by any one of a number of similar remote push-buttons; instead, automatic stopping in response to loss of electrical load has been adopted. Release of a solenoid, which is normally energized by the generator output current, moves the fuel pump rack into the stop position where it is held by a latch until the next start; then a smaller solenoid lifts the latch and restores fuel flow at the same time as the starter motor is energized.

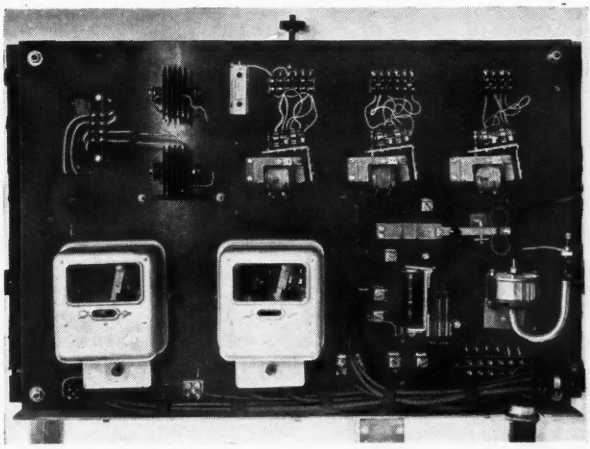
Hot water is provided by a large im-

mersion heater, controlled by a thermostat, which is energized directly from the generator so as to take advantage of every occasion on which the engine runs to add heat to the constantly changing water in the tank.

Lighting is at 110 V, normally from a 110 V battery of small capacity, but whenever the generating plant is operating the lighting circuits are automatically switched over to the low voltage output of a step-down transformer which derives its input directly from the generator. The battery is replenished automatically by a constant potential charger that delivers to the cells an input which varies inversely as their state of charge. The charger, like the water heater, functions whenever the diesel generator happens to be running.

The net result of these several circuiting arrangements is a tendency to minimize light-load running of the diesel plant, with consequential improvement of fuel cost per kWh generated. Safety features include interruption of the automatic starting sequence after an unsuccessful attempt to start without fuel or upon the stoppage of the engine in the event of the failure of the oil pressure for any reason.

The automatic control gear was constructed under the general direction of the engine makers by Gil & Green, Ltd., of Peterborough, who were also responsible for the complete installation.



Automatic controller panel showing (on the right) the patent suction switch which cuts out the starter motor at the selected speed

South African News

(From Our Capetown Correspondent)

A BIG saving in man-hours at the Modderfontein explosives factory of African Explosives and Chemical Industries, Ltd., and at other industrial plants where workers have to seek shelter until electrical storms pass, may result from recent researches at the Bernard Price Institute of Geophysical Research in Johannesburg. The Rand's frequent lightning storms are a great potential source of damage and loss of life. Using radar combined with photography, the Institute can now measure the intensity of any electrical disturbance over the whole Reef area. The apparatus being used at Modderfontein has a loudspeaker. When an electric charge which may cause a serious lightning strike is being built-up in a cloud, a shrill whistle is heard on the speaker. The whistle becomes shriller as the charge becomes more powerful, and dies down to a low hum after the discharge. To carry out observations on the Rand, the Institute has set up stations at Forest Town, Linden and Observatory, each of which is connected to the main laboratory by radio.

While Johannesburg's £13,000,000 power station at Orlando grows towards the stage when it will be the largest municipal undertaking of its type in the Union, the City Council is taking steps to meet the city's demands after 1955. The Administrator of the Transvaal is to be approached to see how the Council could enlarge its present undertaking, either by building another power

station or by taking supplies from some other source. Should the Council build its own station it will probably be sited north-east of the city in the vicinity of Lombardy. The new development will be known as the 1956-60 scheme. As yet only a start has been made on bringing electricity to Johannesburg's large native population.

The S.A. Federated Chamber of Industries is now considering the appointment of a committee to investigate present economic trends. One of the matters which will be examined is the adverse effect of foreign trade on local industry. In common with industrialists in other countries, observers in the Union have been alarmed by the rapid post-war development of German industry, which is seen as a distinct threat to the Union's own industries. The problem has become more acute with the arrival in South Africa of a representative of the combined West German Chambers of Trade and Industry. Before the war Germany exported large shipments of electrical goods to the Union. In the event of the restoration of large-scale trade, South African manufacturers will ask the Government to frame protective measures, where necessary.

ALUMINIUM SHEATHED CABLES

33 kV Impregnated Pressure Type

HAVING overcome the difficulties associated with the production of aluminium sheathed cables, British Insulated Callender's Cables, Ltd., are now making a wide range of sizes and types, the latest development being a 33 kV impregnated pressure cable which is manufactured in 330 yd lengths. The sheath of this type of cable is required to withstand an internal gas pressure of 200 lb/sq in and when lead is used it is necessary to provide external steel reinforcement. This is unnecessary when an aluminium sheath is used, so a further saving in weight and cost is achieved.

The wall thickness of the sheath is not less than 90 per cent of the corresponding lead sheath and the normal rubber bitumen sandwich serving is applied as protection against corrosion.

Satisfactory hand plumbing to the aluminium sheath is another problem which has been overcome and a technique has been developed which enables internal pressures of 1,000 lb/sq in to be withstood for long periods without failure. It is noteworthy that in view of the omission of reinforcing tapes, the joint design is considerably simplified in that the cast plumb used with a normal lead-sheathed joint is omitted, saving cost and jointing time.

B.I.C.C. 33 kV aluminium sheathed impregnated gas pressure cable

Investigations have been made into the most convenient method of applying the aluminium sheath and the dieing down method has been adopted as the only practical means at the moment for producing a seamless sheath. The cable is first drawn into an oversized tube, and both cable and tube are pulled through a "sinking" die which reduces the outside diameter to the required figure. Generally, the reduction in diameter is confined to a maximum of 30 per cent but this can be increased for tubes of below about 1 in outside diameter.

In addition to the routine tests laid down in the C.E.B. Specification C 1947, many long-time stability tests, accelerated ageing tests and impulse voltage tests have been carried out on this cable. These have confirmed the fundamental advantages in performance which are claimed.

North Wales Water Power

LAST week Lord Citrine, chairman of the British Electricity Authority, discussed the North Wales hydro-electric scheme with members of the Welsh Parliamentary Party at the House of Commons. He said it was hoped to complete the surveys in a year's time and when the work was finished a Bill would be prepared. A 6ft square clay and plastic contour plan of the scheme was laid out in the Members' Library and reference room and special maps and statistical charts were hung around the walls.

Commerce and Industry

B.E.A. Claims Against Municipalities
Large Spanish Railway Contract

WRITS have been issued by the British Electricity Authority against a number of local authorities which previously owned electricity undertakings claiming the repayment of certain sums taken from the electricity departments' funds in the period just before the vesting day (1st April, 1948).

One of the authorities concerned is Guildford Corporation, the amount claimed being over £10,000, representing sums transferred to the rate fund in the three years 1945-48, when, it is stated, there were losses on the undertaking. In the case of Eastbourne Corporation, the sum involved is £4,229 in respect of a transfer to the rates in 1947-48.

Wednesbury Wiring Contract

A decision to give a contract for electric wiring to the Midlands Electricity Board, although its tender was not the lowest, was described as "purely a political move," at a meeting of the Wednesbury Town Council last week. The Electricity Board's tender of £2,292, which was £298 more than the lowest, was accepted by the Council, and an amendment by Alderman T. Berry to give the contract to the two lowest tenderers was defeated.

Alderman Berry contended that the whole system of inviting tenders became farcical when very reputable firms were never considered. The standing order said that the lowest tender must be accepted, and legally they could not accept the tender of the Midlands Electricity Board.

Seconding the amendment, Councillor T. Hollingsworth said that when people tendered for contracts they should be able to expect proper treatment, which, in this case, was denied them.

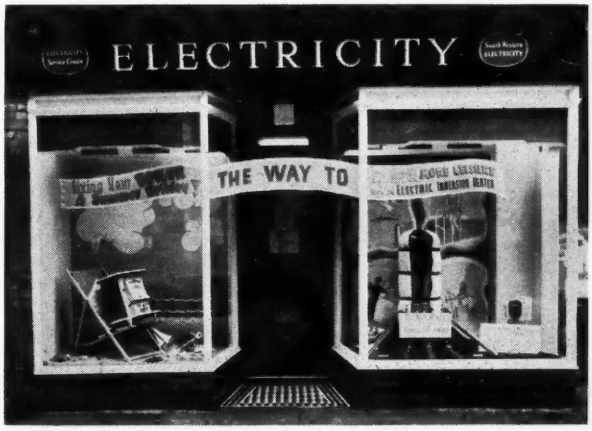
Alderman L. Whitehouse, replying to the criticisms, said he was not concerned with the case at stake. He maintained that the Housing Committee had considered every tender. The quality of the work of the Midlands Electricity Board was good, and the Board should be given a trial.

Projector Lamps for Germany

Ekco-Ensign Electric, Ltd., has received an order from the United States High Commissioner's Office in Germany for 10,000 projector lamps. These are to be used in the film education service operated by the occupying powers.

Window Display Competition

Dartmouth Electricity Service Centre has won first prize and the Area challenge cup in the South Western Electricity Board's window display competition. Second place was taken by Bristol, Colston Avenue, and Bideford was placed third. The judges were Mr. H. G. Davis, display manager of Brights, of Bristol, and Mr. A. J. Symes, F.R.S.A., editor of *Display, Design and Presentation*. The competition, which was organized by the Board's chief commercial officer, Mr. R. W. Steel, aroused great interest among display staff, and eighty-seven



Dartmouth Service Centre's winning display in the South Western Electricity Board's window competition

entries from sixty-five different Service Centres were received.

Spanish Locomotive Contract

In the early weeks of 1950 the Spanish National Railways sent a delegation, headed by the Director-General, to Great Britain to inspect the works of manufacturers of electric traction equipment. As a result of this, and of subsequent negotiations carried on in Madrid, the railways have placed with the English Electric Export and Trading Co. an order for 3,600 h.p., 3,000 V d.c., 5ft 6in gauge, main line electric locomotives to the total value of £2,713,400. The first phase of this contract envisages twenty locomotives to be built at the Preston works of the English Electric Co., Ltd., in conjunction with Vulcan Foundry, Ltd., at Newton-le-Willows as sub-contractors, and it is anticipated that the first of these locomotives will be delivered to Spain in about eighteen months' time.

United States Accessories Market

The Minister (Commercial) to the British Embassy, Washington, has prepared a circular on the market in the United States for wiring accessories, including porcelain and synthetic resin ceiling roses, lampholders, tumbler switches, sockets, outlets and plugs up to 15 A rating. In this he says that while the demand for wiring accessories is large, so far as is known there is no existing market for imported accessories and one would have to be created. The design of wiring accessories as used in the United Kingdom would not be acceptable in the United States when the voltage is normally 110 V (60 cycles). Lamps are of the screw and not the bayonet type, and socket outlet and plugs are of the two-pin type. All electrical devices are subject to approval by the Underwriters' Laboratories, Inc., which tests samples, and, if acceptable, gives them a seal of approval. The report gives prices in the United States of good quality accessories, but says that it is difficult to say whether the United Kingdom prices would be competitive, since it would be necessary to compare the type and quality to which particular prices apply. The Customs duties on the various accessories are also given. The circular has been issued by the Commercial Relations and Export Department of the Board of Trade, Thames House North, Millbank, London, S.W.1. (reference CRE(IB) 37339/49, Com/4039).

Design Photographs

It has been decided by the Council of Industrial Design (Tilbury House, Petty France, S.W.1) that a charge must be made for the loan of prints from its Photographic Library. This will be a minimum of 5s for up to twenty prints for a period of four weeks with a charge of 3d for additional prints. At 1st April there were about 20,000 photographs in the Library classified under many headings including electrical engineering, electric heating appliances, household equipment, scientific instruments, etc.

Sales Team-work Experiment

A successful sales team-work experiment, in which opposing Sub-Area teams were given marks for inquiries and orders received on allotted days, was made by the North Western Electricity Board in connection with the Brighter Homes Exhibition held in the City Hall, Manchester, from 7th to 25th March. Teams from the four Sub-Areas from which the majority of visitors to the exhibition were likely to come were invited to attend, each on a separate day determined by ballot. Points, determined according to the nature of appliances concerned, were awarded for inquiries and orders received, the highest total being gained by the

The North Western Electricity Board's stand at the Brighter Homes Exhibition

Board's No. 2 (Bolton) Sub-Area with 92 inquiries and orders, yielding 499 points. The No. 1 (Manchester) Sub-Area came second with 82 inquiries and orders (479 points). The North Western Electricity Board's stand was an outstanding feature of the exhibition and attracted 1,026 inquiries during the seventeen days of the show. In addition, 4,150 people saw cookery demonstrations and film shows at the Board's theatre.

Deaf and Dumb Demonstration

The first cookery demonstration of its kind in electricity supply was recently staged by the Burnley District Staff of No. 5 Sub-Area of the North Western Electricity Board, when a demonstration and film show were given to the Deaf and Dumb Institute, Burnley. Electrical and entertainment films were shown before and after the cookery demonstration. This was supervised by Miss S. Downie, Burnley district demonstrator, with the assistance of trainee demonstrator Miss Corke. Menus had previously been distributed among the audience. Mr. J. B. Barker, welfare officer to the Burnley Deaf and Dumb Society, interpreted Miss Downie's demonstration by sign language and Mr. R. Gibbons, welfare officer to the East Lancs. Deaf and Dumb Society, wrote the main points on a blackboard in order that the audience could make notes. Mr. Gibbons also repeated Miss Downie's remarks for the benefit of those members of the audience who were able to "lip read."

Oil Company's Brochure

Silvertown Lubricants, Ltd., has sent us a handsomely produced souvenir brochure telling in pictures the history and achievements of the Gulf Oil Corporation of Pittsburg, Pennsylvania, of which Silvertown Lubricants is a subsidiary. The Gulf Oil Corporation has decided to merge all its marketing interests in this country under the title of Gulf Oil (Great Britain), Ltd.

Mr. J. Paterson's Claim Succeeds

In the Court of Session, Edinburgh, last week, Lord Birnam awarded Mr. James Paterson, of Maidens, Ayrshire, the sum of £52,408, which he had claimed from the South West Scotland Electricity Board. Mr. Paterson was general manager of the Clyde Valley Electrical Power Co. from 1st January, 1939, until the nationalization of the electricity supply industry in 1948, when he lost his position. His agreement with the company provided for a minimum salary of £4,500 per annum, and on these terms he was entitled to a yearly pension of £2,250 upon the expiry of his agreement in January, 1954. The Board offered to settle his claim on this basis. Actually, at the time of nationalization, Mr. Paterson was receiving £6,000 a year, entitling him to a pension at the rate of £3,000, and his claim was based on these figures.

In giving his decision Lord Birnam said he was of opinion that no account was to be taken of income tax and surtax. So far as contributions to the superannuation fund were concerned there seemed to be no reason why these should not have been deducted from Mr. Paterson's director's fees and not from his salary.

Brush Far East Company

Brush (Far East), Ltd., has been formed with registered offices in Ocean Buildings, Singapore, to be factory representatives of Petter, Petter-Fielding, McLaren, Mirrlees, National and Meadows diesel engines and of the products of Bryce Fuel Injection, Ltd., and the Brush Electrical Engineering Co., Ltd., in the following countries: Malaya, Indonesia, French Indo-China, Borneo, Sarawak, Siam, Philippines, China, Hong Kong, Japan, Formosa and Ceylon. Mr. H. F. Clements is chairman and the Hon. A. C. Geddes, Mr. F. A. Vaughan, Mr. A. A. King are directors. The individual companies will, however, continue to sell their products through their existing agents.

Exhibits at Toronto

Two stands are being taken at the Canadian International Trade Fair, Toronto (29th May to 9th June), by British Insulated Callender's Cables, Ltd. These will display a selection of the company's resistance welders, power capacitors, crane collector gear and trolley-bus overhead fittings. On the stand of Automatic Electric (Canada), Ltd., there will be shown examples of B.I.C.C. special cables and accessories, h.v. impregnated pressure cable and oil-filled cable.

We have received from the Gauge & Tool Makers' Association a copy of the 96-page catalogue which it has prepared in connection with its members' joint exhibit at the Fair. The cover bears a picture of the Clock Tower at Westminster. Inside full details are given of the products shown by 50 of the members, including many electrical items. This is prefaced by a message from the Association's president, Mr. F. W. Halliwell. In the centre is a double-page spread of eight pictures of "The British Scene"—an attractive touch.

Central Hot-water Systems

The Ministry of Works announces that the Council for Codes of Practice for Buildings has issued in its final form Code 342, which

is concerned with centralized domestic hot-water supply in buildings ranging from small dwelling houses to hotels and schools. The head-code deals with the subject generally; incorporated in the same document are six sub-codes on boilers, calorifiers, storage vessels, pipework, electrically driven circulators and thermal insulation, each with a list of relevant B.S. Specifications.

Copies of this, CP.342 (1950), are obtainable for 8s post free from the British Standards Institution, 24, Victoria Street, London, S.W.1.

London Contractors' Newspaper

Newspaper format has been employed by the London Branch of the Electrical Contractors' Association for a new journal, "Electrical Progress," which it has produced for circulation to members' customers. It has four pages of well-illustrated matter attractively displayed. The subjects covered include a variety of installations by members, television prospects, the approaching golden jubilee of the E.C.A. (1951), a pen portrait of Mr. R. R. Stokes, the Minister of Works, and a "Strange but True" strip of drawings on little-known electrical facts.

Kelvinator Sales Convention

The first post-war sales convention of Kelvinator, Ltd., was held at Buxton on 28th and 29th March. The delegates were welcomed by the Mayor and Mayoress of Buxton, and the business session on the second day covered the various aspects of the company's sales, advertising, distribution, research and development policy. New models of domestic refrigerators, fish cabinet, bottle cooler and service cabinet with frozen food locker were on show. The convention concluded with a banquet and cabaret at the Palace Hotel.

Zinc Price Increase

The Ministry of Supply announced last week that from 4th April the price of zinc would be increased by £2 per ton delivered. Good ordinary brand zinc is now £91 10s per ton and prices of other grades are varied accordingly. Zinc oxide manufacturers also announced an increase of £1 15s per ton.

Engineering Strike Ballot

Although the legality of its action has been questioned by the Ministry of Labour, the Confederation of Shipbuilding and Engineering Trade Unions has decided to instruct its members to proceed with the ballot on the question of strike action. The claim is for £1 a week increase in wages which the Engineering Employers' Federation has rejected. At a meeting last week between Sir Robert Gould, Chief Industrial Commissioner of the Ministry of Labour, and representatives of the Employers' Federation, it was stated that the Federation would not reopen negotiations with the strike threat hanging over them. If the ballot were suspended they were willing to discuss the wage structure of the industry.

The unions' ballot papers were expected to be sent out on Wednesday last, and they are returnable by 30th June. The members are asked to state whether they are in favour of strike action or of submitting the wage claim to the National Arbitration Tribunal.

B.E.A. Managerial Grades

According to the April *Electrical Power Engineer*, it is proposed that members of the technical and administrative staffs of the British Electricity Authority and the Electricity Boards receiving salaries rising to £1,250 or more shall be regarded as coming within the scope of a new Managerial Council. The staff side will represent the Association of Managerial Electrical Executives, the National Association of Local Government Officers, and the Electrical Power Engineers' Association. The interests of those with salaries of over £1,500 will be looked after by a special panel of the Council, the staff side of which will represent the A.M.E.E. only.

Trade Announcements

The telephone number of the auxiliary office of **Babcock & Wilcox, Ltd.,** at Audrey House, Houndsditch, E.C.3, has been changed to Avenue 7171.

Tuscan Industries, Ltd., has removed to 100, Lough Road, Holloway Road, London, N.7, (telephone: North 2452).

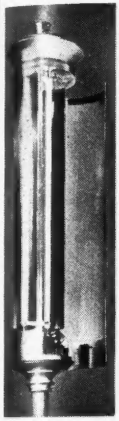
Catalogues and Lists

Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, S.W.1.—Illustrated catalogue of "Avo" electrical testing instruments.

Telegraph Construction & Maintenance Co., Ltd., Telcon Works, Greenwich, London, S.E.10.—Brochure containing data on "Telconstan" (nickel copper) resistance wires and strip.

E.M.B. Co., Ltd., Moor Street, West Bromwich, Staffs.—Leaflet on heavy-duty resistance grids for use in steelworks, etc.

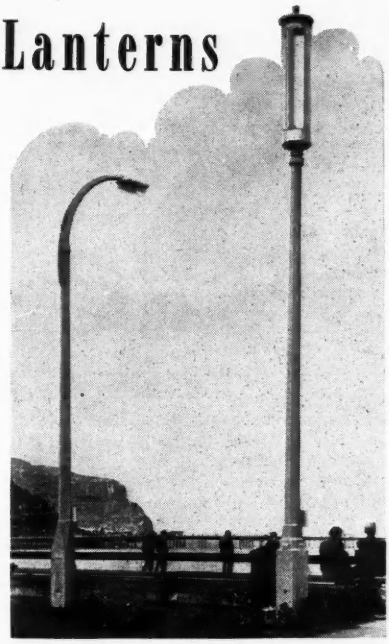
British Central Electrical Co., Ltd., 6-8, Rosebery Avenue, London, E.C.1.—Priced leaflet on the "Waco" bench-type precision drilling machine for the watch, clock and instrument trades.



Vertical Lanterns

Spectacular Lighting of Main Shopping Streets

By N. W. WOOD*



Recently developed prototype vertical fluorescent lantern on concrete column with close-up (open) view of tube inside lantern head

NORMAL street lighting practice caters primarily for the road user. Generally economic factors limit the amount of light that can be afforded and so the amount available is carefully controlled to ensure that the maximum falls on the road surface. Is this the best way of lighting luxury shopping areas: the streets which will earn dollars from the many visitors who, it is hoped, will visit this country during the Festival of Britain in 1951?

These streets are generally at the centre of the city and often near the civic or governmental buildings. The pavements are generally broad and, after dark, thronged with shop window gazers and visitors to the restaurants, theatres and cinemas.

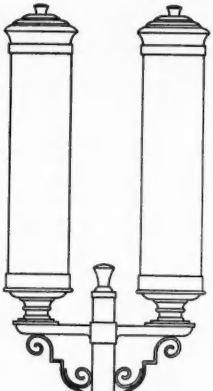
At the moment many city centres and shopping areas are lit by tungsten filament 1,000 or 1,500 W lamps. These installations are now generally 10/20 years old. In many cases, however, it has been necessary to reduce the wattage of the lamps in the interests of fuel economy. This lighting is of good colour, but there is nothing about it that is striking or likely to excite interest. While it is doubtful whether the average road user is conscious of the street lighting, it is probable that something more spectacular and of distinctive colour would be noticed and might well become one of the attractions of a city. There is no doubt that the casual, strolling pedestrian on a sightseeing tour will always follow the brightly lighted streets.

Since the maximum-wattage tungsten lamps are already in use, any further stepping up of the lighting can only be achieved by multiplication of units. Mere numbers, however, are unlikely to attract attention; what are needed are light sources of new shapes and a different mode of lighting. The colour distortion of both mercury and sodium lamps make them unpleasing and they are not really suitable for those parts which cater for the general night life of a city. The most attractive lamp is the 80 W fluorescent. Its high efficiency and long life, with the pleasing colours in which it is now obtainable, satisfy the necessary requirements of high luminous output and interest value. It has, however, one serious limitation as it is known at present, and that is its length of 5ft.

An individual lamp does not provide enough light and it is always necessary to

* Exterior Lighting Dept., General Electric Co., Ltd.

mount several in a single lantern. Four 80 W fluorescent tubes give just about the same amount of light as one 750 W tungsten lamp. When choke losses are taken into account, such a lantern will still be approximately twice as efficient a light producer as the lantern with the tungsten lamp.



Vertical twin lantern post head of pleasing design

There are very few really large permanent installations of fluorescent lighting in this country. They are mainly of three- or four-lamp lanterns at spacings averaging 100 to 120ft. Undoubtedly the most spectacular and probably the finest in the world is in the Brompton Road, London, where there is a small installation of lanterns each housing seven 80 W lamps. Naturally, however, this number has resulted in a bulky lantern. While the local inhabitants and daily users of the road have grown so used to the daylight appearance of the lanterns as to accept them as commonplace, they do appear to be massive to the newcomer.

Adequate Light Essential

Experience has shown that where fluorescent lighting is used it is most important to avoid economizing in light. Most of the installations produce well over 8,000 lumens/100ft of carriageway, 12,000 to 13,000 lumens being commonly demanded. In several cases in which a lower figure has initially been provided, the lighting authorities have subsequently asked for an improvement. The colour of the light appears to have some bearing, "Daylight" lamps being generally preferred to "Warm White," which appear to lack sparkle.

In all these installations the lamps have been used horizontally, the light control being either by polished metal reflectors or refracting prisms; the light has been deliberately kept as much below the horizontal as possible. Recently, however, the G.E.C. has developed a lantern in which four lamps are used vertically. It has been evolved specifically for the lighting of town centres where the impressive building facades are worthy of being seen. It is not practicable to restrict the light emitted by such a lantern above the horizontal; in fact, approximately half the light from the lantern is at high angles. Any system of over reflectors or louvering simply makes the lantern cumbersome or inefficient.

Better Appearance

Vertical accommodation overcomes one of the major problems of fluorescent lantern design, namely the mass and the difficulty of producing a pleasing appearance in a lantern at least 5ft long and probably 2ft deep, attached horizontally to a concrete or steel column at a mounting height of 25ft. A vertical lantern can be made to grow out of the top of the column, which can be designed to set off the appearance of the lantern and need not be 25ft high, or look at all cumbersome.

It is considered that there would be no æsthetic objections to the use of such combinations of lantern and column, while the lighting results at night would be excellent. Instead of roads rather tunnel-like in their appearance, flanked by buildings of which only the lower portions would be visible, the sight-seeing pedestrian would see pillars of light enticing him into thoroughfares bounded by floodlit buildings.

The vertical lantern will not be the only type of decorative fluorescent street-lighting. Lamps of half-circle or circular and other shapes will be available in the future, offering the possibility of using several, one above the other, in relatively short lanterns.

There is no doubt that both the vertically burning 5ft lanterns and the rather shorter lanterns housing circular fluorescent lamps would have the attraction of novel appearance and, at the same time, would produce the type of light distribution best suited to the impressive surroundings which are generally to be found in the areas of a city where crowds congregate at night.

Insulation Tests on Supply Networks

By "SIGMA"

Simplified Procedure for Proving Formulæ

THERE are many ways of obtaining an approximate value for the insulation resistance of a supply network while it is in service, and the appropriate formulae can be found in most books on electrical testing. The proofs of these formulae by direct methods often involve cumbersome algebra, but they can be greatly simplified by using a general principle which is applicable to all the tests.

From Thevenin's theorem it can be stated that when a change in the current flowing in an intentional connection of any point of a network to earth causes, or is caused by, a change in the potential to earth of that point, the change of potential is equal to the change in current multiplied by the insulation resistance of the network. This principle is directly applicable to d.c. networks and it can be modified so that it will apply to a.c. networks in which capacitance as well as leakage currents can flow from the conductors to earth.

Fig. 1 illustrates the leakage paths to earth of the conductors in a three-wire d.c. system, having a voltage V between the outers. If v_p, v_0 and v_n are the potentials to earth of the positive, middle wire, and negative mains respectively and the middle wire potential is positive, then $v_p = \frac{1}{2}V + v_0$, $v_n = \frac{1}{2}V - v_0$, $v_p + v_n = V$. Suppose a voltmeter of resistance r is connected to the positive main and shows a reading V_p. The potential of this main will change by an amount $v_p - V_p$, caused by an alteration in the current through the instrument from zero to $\frac{V_p}{r}$.

Hence, if R is the combined insulation resistance of the network,

$$v_p - V_p = V_p \frac{R}{r} \quad .. \quad .. \quad (1)$$

Similarly, if the voltmeter is connected to the negative main and reads V_n

$$v_n - V_n = V_n \frac{R}{r} \quad .. \quad .. \quad (2)$$

Adding equations (1) and (2) and recollecting that $v_p + v_n = V$

$$V - (V_p + V_n) = \frac{R}{r}(V_p + V_n)$$

from which

$$R = r. \frac{V - (V_p + V_n)}{V_p + V_n},$$

the latter equation including the resistance of any intentional connection of the middle wire to earth.

If the system is a two-wire one, this will correspond to r_0 being infinite. In this case $\frac{v_p}{v_n} = \frac{r_p}{r_n} = \frac{g_n}{g_p}$ where g_p and g_n are the leakage conductances of the positive and negative mains respectively. Furthermore, from equations (1) and (2) $\frac{v_p}{v_n} = \frac{V_p}{V_n} = \frac{g_n}{g_p}$, so that if $G = \frac{1}{R}$.

$$G = \frac{1}{r}. \frac{V_p + V_n}{V - (V_p + V_n)},$$

$$g_p = \frac{1}{r} \frac{V_n}{V - (V_p + V_n)} \text{ and}$$

$$r_p = r. \frac{V - (V_p + V_n)}{V_n}$$

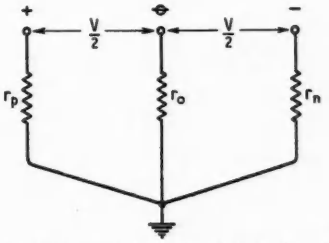


Fig. 1.—Diagram showing earth leakage paths in a three-wire direct-current system

with a corresponding formula for r_n. This test is only suitable for high insulation resistance values, when the potentials to earth are changed appreciably by the connection of the voltmeter.

If the middle wire potential changes from v_0 to v_1 when it is earthed by a resistance r, the current in the earthing connection will be $\frac{v_1}{r}$, so that

$$v_0 - v_1 = \frac{v_1 R}{r} \text{ and } R = r.\frac{v_0 - v_1}{v_1}.$$

If the resistance r is shunted by one of similar value, and the potential takes the new value v_2, then the current through the earthing connection will be $\frac{2V_2}{r}$. The change in the current $\frac{(2v_2 - v_1)}{r}$ produces a change in the middle wire potential $v_1 - v_2$ which equals $\frac{R}{r}(2v_2 - v_1)$ from which $R = r_1 \frac{v_1 - v_2}{2v_2 - v_1}$.

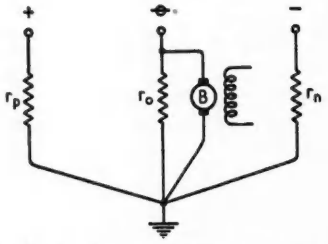


Fig. 2.—Possible method of insulation resistance testing without interrupting the middle wire earth connection of a d.c. system

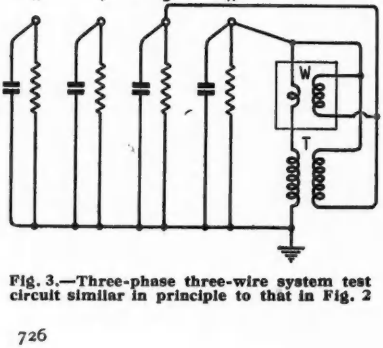


Fig. 3.—Three-phase three-wire system test circuit similar in principle to that in Fig. 2

Therefore, v_1 and v_2 are proportional to the currents in one of the resistances, and current values can be substituted for voltages in the last formula.

The drawback of tests based upon observation of the middle wire potential is that this potential may be inconveniently low. If the insulation resistance of the network is not more than a few hundred ohms, then a very approximate value of the potential of one of the outers, say the positive v_p, can be obtained by connecting a high resistance voltmeter between this main and earth. Call this reading V_1. If the positive main is now earthed through a resistance r and this causes the voltmeter reading to change to V_2 then, as the current in the resistance is $\frac{V_2}{r}$,

$$V_1 - V_2 = V_2.\frac{R}{r} \text{ and } R = r.\frac{V_1 - V_2}{V_2}$$

R, of course, includes the resistance of any intentional connection of the middle wire to earth.

All the foregoing tests depend upon the idea of changing the potentials of the mains by an intentional earth connection, and all depend upon the direct connection of the middle wire to earth being temporarily interrupted. Fig. 2 illustrates a possible method of insulation resistance testing without interrupting the middle wire earth connection. The armature of a boosting generator is interposed in this connection, and the middle wire potential is made to change by the boosting voltage. If this voltage v causes the current from the middle wire busbar to change from I_1 to I_2 then

$$v = (I_1 - I_2)R \text{ and } R = \frac{v}{I_1 - I_2}.$$

In this formula $(I_1 - I_2)$ is an algebraic difference; that is, if the boosting voltage causes the current to reverse, the two values are added.

Testing by the use of a booster, although feasible, would rarely be used for d.c. systems. In the case of an a.c. supply system a boosting voltage can be obtained from the secondary of a transformer connected as shown in Fig. 3 for a three-phase four-wire system. In this case the boosting voltage which changes the potential of the neutral is equal to the change in the current in the neutral earth

connection multiplied by the combined impedance Z of all the conductors to earth. This gives the vector equation

$I_1 - I_2 = \frac{v}{Z}$. If V is the supply voltage applied to the primary of the boosting transformer, so that V is in phase with v, then

$$V(I_1 - I_2) = \frac{Vv}{Z}.$$

Substituting the algebraic values of the vectors I_1 I_2 and $\frac{I}{Z}$, C being the combined capacitance of the network, and ϕ_1 and ϕ_2 the phase differences of I_1 and I_2 relative to V, we have

$$V[I_1(\cos \phi_1 + j \sin \phi_1) - I_2(\cos \phi_2 + j \sin \phi_2)] = Vv\left(\frac{I}{R} + j.\frac{I}{C}\right)$$

equating the real parts,

$$V(I_1 \cos \phi_1 - I_2 \cos \phi_2) = W_1 - W_2 = \frac{Vv}{R}$$

and $$R = \frac{Vv}{W_1 - W_2}$$

where W_1 and W_2 stand for the watts arising from the association of I_1 and I_2 respectively with the voltage V, and are evidently the readings of the wattmeter W in Fig. 3. The quantity $(W_1 - W_2)$ in the formula is an algebraic difference. If, as is advantageous, a centre-zero wattmeter is used for this test, $(W_1 - W_2)$ corresponds to the movement of the pointer caused by the boosting voltage in the neutral earthing connection.

H.F. Voltage Measurements

A RECENT publication of the American National Bureau of Standards deals mainly with voltage measurements at frequencies in the upper audio- and radio-frequency ranges, including part of the ultra-high-frequency range. The subject matter has been selected to give both engineers and students a more comprehensive picture of these methods of measurement than is now available in textbooks and handbooks. It is, however, limited to principles and methods that have met with some degree of success for both high and moderate precision, with emphasis on those developed for standardization work at the National Bureau of Standards. This 14-page illustrated booklet, "High-Frequency Voltage Measurement," by Myron C. Selby, is available, price 27 cents (including postage) from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Remittances from foreign countries must be in U.S. currency.

Canadian Water Power Resources

ACCORDING to the Canadian Bureau of Statistics, production of electricity in the country last year amounted to 46,673.2 million kWh compared with 44,569.8 million in 1948. Output of primary power rose from 41,958.5 million to 43,455.1 million kWh. Quebec's output at 25,612.6 million kWh was more than twice as much as that of any other province, being followed by Ontario with 12,166.0 million.

The Water Resources Division of the Canadian Department of Resources and Development, has issued its annual review showing that the recorded water-power resources of Canada, including the new province of Newfoundland, total nearly 43 million h.p. at average flow, representing a feasible turbine installation of over 55 million h.p. The total turbine installation at the end of 1949 is given as 11,613,333 h.p., indicating that only 21 per cent of available resources has been developed. During 1949, hydro-electric construction was very active with 480,565 h.p. of new capacity coming into operation and with good progress being made on other new developments. The installed capacity of water-power plants in Canada now equals 857 h.p. per thousand of population. Copies of this review may be obtained free of charge on application to the Chief, Water Resources Division, Department of Resources and Development, Ottawa.

Queensland Scheme Approved

THE Queensland State Cabinet has approved the construction of the first stage of the Tully Falls hydro-electric development. The plan calls for the building of a dam 147ft high; diversion weir, intake works and 2,500ft-long tunnel; power station building with two 18,000 kW Pelton wheel driven alternators; and substation and 214 miles of 132 kV transmission line to serve Mount Garnet, Atherton, Cairns and Innisfail. The total cost of this part of the scheme is estimated at £7,636,000. Eventually 92,400 kW will be provided in six stages at a cost of £11,561,000.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

REPORTS AND DIVIDENDS

A. Reyrolle & Co., Ltd., report a group trading profit for 1949 of £1,356,954, as compared with £757,589 for the preceding year, to which is added other income of £60,609, making £1,417,643. Depreciation requires £67,767, directors' fees £1,600, staff superannuation £31,742, provision for employees' benefits £10,000, loan interest £5,274 and taxation £713,585, leaving a profit of £587,675 (against £303,598). General reserve receives £200,000, development expenditure account £100,000, stores and work in progress reserve £75,000, and renewals £75,000. As already announced the ordinary dividend for the year is 15 per cent (against 12½ per cent), and the balance carried forward is £162,270 (against £158,480 brought in).

The annual meeting will be held on 27th April. In his statement, which has been issued with the report and accounts, Sir Claude Gibb (chairman) says that their export business continues to grow and now amounts to 40 per cent of the total orders received. There occurred during 1949, however, a marked change from a sellers' to a buyers' market, coupled with increased competition from Continental, American and Japanese manufacturers. International competition is back almost at its pre-war severity, and quality, efficiency and price, and delivery periods are the only criteria now deciding the placing of orders. For their company 1949 was an exceptional year as several large contracts received in earlier years under favourable conditions were completed and brought into the year's accounts. A major extension to the British Short-Circuit Testing Station is essential if they are to be able to prove fully the switchgear of high voltage and greater breaking capacity they are now designing and producing. This extension is estimated to cost over £500,000 and has been put in hand. The works have been extended to enable new products to be manufactured rapidly and efficiently. New high bays for very-high-voltage switchgear have been brought into operation during the year. A special bonus amounting to about £30,000 is being paid to employees.

The Telegraph Construction & Maintenance Co., Ltd., reports a consolidated trading profit for 1949 of £302,205, as compared with £314,309 for 1948, to which is added investment income, rents, etc., making a total of £338,058. Of this depreciation requires £73,909, taxation £111,258, pensions £5,227, and debenture interest £345, leaving a net profit of £147,319 (against £151,820), to which is added £71,769 brought in, making £219,088 available. Replacement of assets reserve receives £50,000, research and development reserve £45,000, and other reserves £5,614. As already announced, the final dividend is 4 per cent (against 5 per cent), paid on larger capital, the total distribution for the year being 9 per cent (against 10 per cent). The balance carried forward is £75,484.

In his statement on the report and accounts Lord Colgrain (chairman) says that the profits from the operation of associated companies are higher than last year, which is due to a better result from Submarine Cables, Ltd. Visits have been made by executive directors and senior staff to the hard currency areas, which have resulted in the procuring of orders, both for dollars and other currencies. Working arrangements have been concluded in many countries. The company has been successful in designing and obtaining orders for a novel cable for land communication over long distances. Another development is in connection with their new rod rolling mills which are now in operation. These mills will enable them to enter new markets hitherto not open to them with some of their specialized metallurgical products. Their export drive in this division has been greatly intensified and the direct exports now amount to approximately 25 per cent of the total sales. They have had an active year in all sections of the business, though towards the end of the year orders in their Power Cable Department were considerably reduced, largely due to lack of demand in the home market, which has been aggravated because some of their export orders have been held up for currency or import permits. The metals division has had a successful year, but the high frequency cable section, though successful, has suffered from trade fluctuations. They took steps at one time to close down their extension factory of this section, but it is now operating again on a modified scale. The direct export business for this department amounts to 45 per cent. The Selborne Plantation in Malaya has had a satisfactory year. Submarine

Cables, Ltd., which is owned equally with Siemens Bros. & Co., Ltd., has also had a successful year, and the output reached the highest level in volume since the company was formed. Some interesting new submarine cables have been designed and sold and others are being made which involve the use of submerged repeaters.

The **Watford Electric & Manufacturing Co., Ltd.,** reports a trading profit for 1949 of £37,552, as compared with £39,678 for 1948, plus other income making £41,063. After making various provisions and adding £60,537 brought in, the balance available is £104,493. Taxation requires £20,134 and special depreciation £1,045. The ordinary distribution for the year is maintained at 20 per cent by a final dividend of 10 per cent and a bonus of 5 per cent. The balance carried forward is £73,018.

James Booth & Co., Ltd., report a consolidated trading profit for the year ended 31st December last of £125,464, as compared with £245,512 for the preceding year, to which is added interest and registration fees, making £130,722. After deducting depreciation, directors' fees, taxation, etc., there is a net profit of £46,245 (against £105,582), to which is added provision for tax not required £224,825, making £271,070. Revenue reserves receive £110,000 and additional depreciation £50,000. The ordinary dividend for the year is unchanged at 20 per cent and £364,491 is carried forward (against £342,081 brought in).

Cable & Wireless (Holding), Ltd., reports a group profit for 1949, after providing £1,629,000 for United Kingdom taxation, of £1,324,000, which includes a net sum of £838,000 for the interest received from H.M. Treasury in respect of the years 1947 and 1948. It is proposed to pay an ordinary dividend for the year of 4 per cent less tax (unchanged).

At a meeting of ordinary stockholders, followed by an extraordinary meeting held on 5th April approval was given to the modified scheme of arrangement reported in our issue of 24th February.

Waygood-Otis, Ltd., reports a consolidated net profit of £338,248 for 1949, as compared with £210,000 for the preceding year. It is proposed to pay a final ordinary dividend of 15 per cent (against 5 per cent), making 35 per cent for the year (against 25 per cent).

Sangamo Weston, Ltd., reports a profit for 1949, after providing for taxation, of £116,144, as compared with £113,293 for 1948. It is proposed to pay a dividend of 10 per cent, less tax, on capital as increased by a 100 per cent bonus issue. This compares with 17½ per cent on the old capital.

NEW COMPANIES

W. Newton (Engineers), Ltd.—Registered 25th March. Capital £3,000. Electrical and heating engineers, etc. Subscribers: W. Newton and F. W. T. Abraham. Regd. office: 8, Silver Street, Aylesbury, Bucks.

A. J. Record & Son, Ltd.—Registered 27th March. Capital £10,000. Wireless, electrical and television engineers, etc. Directors: A. J. Record and A. J. Record, jun. Regd. office: Midland Bank Chambers, High Street, Exeter.

W. T. Parker, Ltd.—Registered 25th March. Capital £40,000. Wireless, electrical, lighting, telephone, mechanical and general engineers, etc. Directors: W. T. Parker (permanent), Mrs. Florence A. Parker and D. W. Parker. Regd. office: 113, Station Street, Burton-on-Trent.

Morrison Automatic Pumps, Ltd.—Registered 25th March. Capital £1,500. Manufacturers, distributors and retailers of mechanical and electrical pumps of all kinds, etc. Directors: A. C. Morrison and J. Lilliman. Regd. office: 4, Wyecliffe Street, Leicester.

Horner (Maintenance) Services, Ltd.—Registered 24th March. Capital £1,000. Manufacturers and repairers of and dealers in electric light and fluorescent lighting reflectors and signs, etc. Directors: N. G. Horner, T. Davis, D. C. L. Gratte and J. R. Milborrow. Regd. office: 506, Ulster Chambers, 168, Regent Street, W.1.

Dowson, Hird & Edkins, Ltd.—Registered 23rd March. Capital £3,000. To acquire the business of an electrical and radio engineer carried on by W. Dowson at 40, Market Place, Bishop Auckland. Directors: Mrs. Ruth P. Hird and W. F. Hird. Solicitors: Booth and Dixon, Bishop Auckland.

Teleonics (Communications), Ltd.—Registered 31st March. Capital £200. Distributors and manufacturers of, agents for and dealers in radio, television and radar sets, radiograms, etc. Directors: A. C. Wilkinson and Mrs. Georgina Wilkinson, both of 4, Hogarth Road, S.W.5.

Berley (Developments), Ltd.—Registered 31st March. Capital £6,000. Designers, manufacturers, factors, repairers, exporters, importers and merchants of and dealers in electrical and radio apparatus, etc. Directors: D. Horwich (chairman), S. M. Horwich, and M. H. Woodard. Regd. office: 35, Gloucester Place, W.1.

LIQUIDATIONS

Carol Manufacturing Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. E. Attwood, 20-21, Lawrence Lane, E.C.2.

FINANCIAL SECTION

STOCKS and SHARES

THE British Electricity Authority is expected to make a new issue of stock in the fairly near future. In view of the firmness of the market for gilt-edged securities, the present time would appear to be auspicious for launching what is certain to be a substantial amount of stock. The terms, however, will have to be rather different from those of the last issue of British Electricity Threes in November, 1948, when £100,000,000 of the 1974-77 stock was issued for cash at 99½; to-day's price of that particular issue in the market is 92½. The popular stock is that dated 1968-73, of which there is over £340,000,000 in issue, the price being about 93½.

Cable and Wireless Scheme

Following their emphatic approval of the amended Cable and Wireless (Holding) reconstruction scheme, the company's stockholders are now in possession of the forms on which they must indicate their selection from the various options open to them. They have until 28th April to make up their minds. Thereafter, it is hoped to secure the approval of the Courts in time to make the scheme operative by 5th June. Meanwhile, a 4 per cent dividend has been declared on the ordinary stock, the price of which is 278½. This compares with the figure of about 295 estimated as the value of the option to receive, for every £100 stock, £125 Savings Bonds and £180 of the new 3 per cent loan stock, to be issued at par. Instead of the latter, stockholders may take an equivalent amount of ordinary stock. Globe Telegraph ordinary are the pence higher at 43s 9d.

Company Reports

Full accounts issued by A. Reyrolle show the 15 per cent dividend to be covered by distributable earnings equal to over 100 per cent on the ordinary capital. Together with the addition of another £450,000 to various reserves, and the surplus of over £3,750,000 current assets, the report fortifies shareholders against the chairman's warning that 1949 saw the peak of what may be termed the easy times. At 65s, the shares retain the rise which followed upon publication of the results. The yield is £4 12s 6d per cent. Telegraph Construction's profit for 1949 gives earnings of 27 per cent on the increased ordinary capital, the dividend being covered more than three times. On an 8 per cent dividend basis the shares at 36s pay £4 9s per cent on the money. Watford Electric 2s shares are quoted at 6s, to yield 6.2/3 per cent on the 20 per cent distribution now being paid. Brush Electrical Engineering is to pay 10 per cent again on its doubled capital. The shares at 6s 3d are a shade easier.

Electric Battery Dividends

Chloride Batteries, Ltd., is expected to declare the final dividend, and preliminary profits, for 1949 before the end of the month. The £1 "A" shares are a good market meanwhile at 46s 3d. For 1948, the company paid a conspicuously conservative total of 20 per cent, of which half was declared as bonus. After the interim had been maintained at 5 per cent, a capital bonus of 100 per cent was distributed from ample reserves at the end of last year. If the coming final is restricted to the same amount as was paid out last year, the yield on the shares will be a moderate £4 6s 9d per cent. Ever Ready's results are due about the same time. On the 40 per cent dividends of recent years, the 5s shares at 31s 3d pay £6 8s per cent.

Changes on the Week

Price changes since a week ago are few and far between. De la Rue shares are dull at 20s. Hoovers at 37s have risen 1s. Electric Construction at 47s are $\frac{1}{16}$ higher. Cawnpore Electrics at 40s and Palestine Electric "A" at 22s 6d are better on the week. New York and Montreal have been pressing buyers of Canadian Marconis. From 26s 3d on 31st March, the price shot up to 34s 6d before reacting to 31s 6d. The last dividend paid by the company was in April, 1946.

Preference Shares

Well-secured preference shares continue to hold their prices tolerably well, the only feature being a persistent discrimination against the high-priced issues. Siemens 10 per cents, for instance, can be bought at 39s to yield over 5 per cent, while the junior 4 per cents (which have the admitted advantage of fixed redemption terms) are quoted above their par value. G.E.C. 4¼ per cents at 20s 9d yield £4 2s per cent, against £4 13s 4d per cent from the senior 7½ per cent issue at 32s. Shares on offer in fair numbers include Hackbridge Cable 5 per cent preference at 22s 3d and Enfield Cable 4½ per cent at 21s 6d, the respective yields being £4 11s and £4 3s 9d per cent.

Industry and the House

Awaiting the Budget

By F. J. ERROLL, M.A., A.M.I.E.E., M.P.

PARLIAMENTARY business during the last fortnight has in the main been quiet. The House is clearly waiting for the Budget, it being recognized that this will be the great test of the Government's ability to retain office.

As a preliminary to the Budget the Treasury has issued a somewhat belated "Economic Survey for 1950." This is a modest document when compared with its predecessors. Gone is all reference to manpower "targets." Instead there are only the most tentative "forecasts" of what is likely to be achieved in 1950 by the nation and by individual industries.

Power Plant

The reference to the electricity supply industry is brief and confined to two paragraphs in a document of 52 pages. The Survey admits that it was not possible to achieve the addition of 1,000 megawatts of new generating capacity forecast in the previous Survey. Nevertheless the capacity of new turbo-alternators installed during 1949 amounted to 826 megawatts, a record for the country. New capacity actually put into commission totalled 703 megawatts.

In regard to 1950 the Survey is cautious, confining itself to the forecast that the amount of new generating capacity to be commissioned should exceed the growth of demand "so that if other factors are unchanged further improvement may be expected."

The Chancellor of the Exchequer has also made a statement about Britain's gold and dollar reserves since devaluation last September. These reserves have considerably improved, but Sir Stafford was careful to make it plain that the improvement would not necessarily continue. It was left to Sir Waldron Smithers, Conservative M.P. for Orpington, to point out that during the last six months we had in the main been relying on stocks of raw materials purchased before devaluation which, when converted into manufactured articles, would fetch correspondingly higher prices in sterling after devaluation. The real test, he asserted, was still to come, namely when we were compelled to purchase and use new stocks of raw materials bought since devaluation.

Although the Budget, and the various stages of the Finance Bill which gives effect to the Budget Resolutions, will be the main Parliamentary business after the Easter Recess, Mr. Morrison has informed the House that there are to be three more debates on nationalized industries, or "socialized" industries as he prefers to call them. Transport and coal have been debated recently and it seems reasonably certain that the House will devote a day to the discussion of the affairs of the British Electricity Authority. As Minister of Fuel and Power, Mr. Noel-Baker will presumably have the task of defending the record of the Authority since its formation.

Mr. Noel-Baker had also to defend the National Coal Board during the debate on dirty coal on 29th March. It was this debate which led to the first defeat of the Government, by 26 votes. Who knows what may happen on electricity?

History of I.E.E. North-Western Centre

IN a recent issue we published a report of an exhibition held by the North-Western Centre of the Institution of Electrical Engineers at the Central Library, Manchester, in connection with its jubilee. The occasion is also marked by the publication of an excellently produced 65-page book by L. H. A. Carr, M.Sc. Tech., M.I.E.E., which contains a concise and yet complete historical record of the Centre's activities since its inception and also of the Northern Society of Electrical Engineers from which it was formed in 1900.

PARLIAMENTARY NEWS

By Our Special Reporter

IN the House of Commons last week Mr. Erroll asked the Postmaster-General if he was prepared to hire the television transmitters and studios to private concerns for television broadcasts during periods when the British Broadcasting Corporation television programme was not being broadcast.

Mr. Ness Edwards said he was not. This would be contrary to the recommendation of the Hankey Committee, which was accepted by the Government, that the B.B.C. should operate the television service.

Electricity in West Africa

Mr. Sorensen asked the Secretary of State for the Colonies what consideration had been given to the development of electricity generation in Nigeria; and the possibility of co-ordinating electricity enterprise both with the Gold Coast and with French West African Colonies.

Mr. J. Griffiths said that the Nigerian Legislative Council was considering a Bill for the establishment of a publicly owned Nigerian Electricity Corporation, and plans for the development of electricity generation were proceeding. The possibility of co-ordinating electricity enterprise with neighbouring territories would be for the Corporation to consider.

Hand Microphone Telephones

Mr. Erroll asked the Postmaster-General when he was going to introduce a modern hand microphone telephone instrument.

Mr. Ness Edwards said that the present instrument was of modern and pleasing design and incorporated several improvements over the original types. It was highly efficient and gave general satisfaction.

Generating Plant Programme

Mr. Ellis Smith asked the Minister of Fuel and Power on what date the plan was prepared to meet the electric power needs of the country; how far had the delivery dates of the plant ordered been carried out; and if the buildings were ready to receive the power plant when it was ready for the sites.

Mr. Noel-Baker said that the planning of generating plant to meet the electric power needs of the country was a continuous process. Before the industry was nationalized the Central Electricity Board every year reviewed the expected requirements for five years ahead, and planned the extension of plants accordingly. The British Electricity Authority now did the same. He was informed that in very few cases during the past four years had the original dates of delivery of plant been adhered to while, in a number of cases, delays in getting possession of sites and in starting work on them had resulted in plant being ready before the buildings were ready to receive it. All these cases, of course, related to orders given and work started before vesting date.

Details of Controls

In the course of a reply to Mr. Maudling, the Minister of Supply (Mr. George Strauss) said that included in the controls still exercised by his Department over the acquisition, manufacture and disposal of raw materials and manufactured articles were control over the acquisition of pig iron; iron and steel scrap; semi-finished and finished steel; over the disposal of iron and manganese ores and iron and steel products for export; and control over the acquisition and disposal of aluminium, copper, lead and zinc.

As regarded machinery, plant and appliances and parts, control was still exercised over the manufacture of refrigerating machinery, electrical hair-waving, hair-drying and hand-drying machines; pressing, drying, heating and cleaning apparatus of a kind suitable for domestic or personal use, including water heaters, vacuum cleaners, motor-car heaters (not being heaters designed solely for heating motor car engines or radiators) and heating pads and blankets, but excluding certain appliances for space heating and water heating; curling irons, waving irons, dry shavers, smoothing irons, lighters, lighter elements, hair clippers, health exercisers, drink mixers, and fans with motors not exceeding $\frac{1}{10}$ h.p.

Scottish Undertakings' Reserves

In reply to a question by Lt.-Commander Clark Hutchison, Mr. Robens, Parliamentary Secretary, Ministry of Fuel and Power, said that on 15th March the Minister received from the South East Scotland Electricity Board a submission regarding the disposal of general reserve funds under the Electricity Act, 1947. The matter was now under consideration.

ELECTRICITY SUPPLY

Contracts for Power Plant
Aberdeen-Dundee Transmission Link

DURING the past month contracts have been placed by the British Electricity Authority for power station, switching and transforming station and transmission equipment amounting in the aggregate to £1,894,567. The principal contracts include the following: Plymouth "B" generating station, circulating water system: John Laing and Son, Ltd. Connah's Quay station, Chester, reclamation works: Westminster Dredging Co., Ltd. Usk Mouth station, Newport, Mon, 132 kV overhead line extensions: Balfour Beatty and Co., Ltd. Barking "C" station, 132 kV and auxiliary cables: Pirelli-General Cable Works, Ltd.

Ilford substation, 60 MVA 132/33 kV transformers and earthing transformers: English Electric Co., Ltd. Dumfries substation, 132 kV 2,500 MVA switchgear: British Thomson-Houston Co., Ltd. Oldbury substation, Worcs, 45 MVA 132/33 kV transformers and earthing transformers: General Electric Co., Ltd. Deptford substation, 60 MVA 132/66 kV transformers; Smethwick substation, 60 MVA 132/33 kV transformers and earthing transformers; and Capenhurst substation, 45 MVA 132/11 kV transformers and earthing transformers: Ferranti, Ltd. Carrington-Altrincham-Sale, Cheshire, 132 kV overhead lines: Watsham's, Ltd.

Drakelow Power Station

The B.E.A. has received the consent of the Minister of Fuel and Power to the establishment of a new power station at Drakelow, near Burton-on-Trent. The first section of the station covered by the consent will comprise two 60,000 kW turbo-alternator sets, two 515,000 lb/hr boilers and one cooling tower. When fully built the station will have an installed capacity of 240,000 kW.

Ash Disposal

Because of the effect it might have in reducing the flood path of the river, a proposal by the British Electricity Authority to use about eleven acres of land at Lower Mitton, near Stourport, for tipping waste ashes was not approved by the Severn River Board. Following consultations, the B.E.A. then sought permission to use an area of only three acres at a place which would hardly affect the flow over the flood path, and this has now been approved by the River Board with the stipulation that the site shall not be used if an alternative one can be found.

Scottish Transmission Lines

The Secretary of State for Scotland, Mr. Hector McNeil, has confirmed a scheme prepared by the North of Scotland Hydro-Electric Board for the erection of overhead transmission lines from Aberdeen to Dundee to link up electricity supplies in these cities. The lines will run from a transforming station which is at present being erected at Craigiebuckler, Aberdeen, through the counties of Aberdeen, Kincardine and Angus to an existing transforming station at Strips of Craigie, Dundee. The scheme is estimated to cost £372,000. The Amenity Committee was consulted about the effects on the amenities of the districts through which the lines pass. It did not make any recommendations, but obtained an assurance from the Board that the lines would not interfere with any places of historic interest. Objections were lodged against the scheme but were not persisted in. A White Paper on the project has been published and is available from H.M. Stationery Office, price 1d net.

Supply to Upper Wharfedale

Easter visitors to Wharfedale, one of the most popular of the Yorkshire dales, found that the main topic among the villagers was the new electricity service. On 5th April the high voltage supply to two main feeders was switched on at Swinden substation by Councillor Wright Snowden, J.P., chairman of Skipton Rural District Council. One feeder supplies Threplands and Cracoe and the other Hebden, Burnsall, Thorpe, Threshfield and Grassington. Mr. W. M. Lapper, O.B.E., chairman of the Yorkshire Electricity Board, switched on the low voltage supply to the village of Burnsall, the pretty spot known to many thousands of visitors who come each year to enjoy the river scenery and the walks along the river banks. The villages of Cracoe and Burnsall received a supply immediately and the other villages will follow as quickly as the

work can be done by the Yorkshire Board.

The Board's mobile showroom has been touring the villages, the staff dealing with numerous inquiries and requests for advice. The whole scheme covers 850 premises, 46 farms (the area includes the famous Craven district of first-class farming land) and 11 hotels. A total of 5.4 miles of 11 kV overhead line has been erected and 1.7 miles of low voltage cables laid and erected.

Gasworks Plant

Plant enlargement and reconstruction within the area of the West Midlands Gas Board was spoken of by Mr. G. le B. Diamond, chairman of the Board, at the annual luncheon of the Midland Wholesale Coal and Coke Traders' Association in Birmingham. He is reported to have said that the programme included the installation of a gas turbo-generator in the Foleshill gasworks, Coventry, to generate electricity for use in those works. It was to be operated "entirely by waste heat."

North Wales Rural Extensions

At the meeting of Ogwen (North Wales) Rural District Council it was reported that letters had been received from the Merseyside and North Wales Electricity Board concerning the provision of an electricity supply to Caerhun, Tanlon, Talybont and the Tanysgrafell district. At Caerhun the work on the mains was in progress, and the other places were included in the North Wales schemes. A survey was being conducted.

Amateur Electrical Work

The South Eastern Electricity Consultative Council at its recent meeting decided to recommend that steps should be taken to educate the public in the safe use of electrical apparatus through the medium of films, broadcasting and school instruction. It was suggested that stick-on labels circulated with the accounts might call attention to the danger of amateur installation work. The Council rejected a proposal for the inspection of installations in houses.

Co. Donegal Electrification

As a first step for bringing electricity to Co. Donegal the Irish Electricity Supply Board proposes to erect a main 38 kV transmission line from the Erne station at Ballyshannon via Donegal town and Ballybofey to Letterkenny. In addition, it is proposed to canvass rural areas in this region and if the returns are sufficiently good to give a supply under the Rural Electrification Scheme. The Board also proposes to undertake development along the south coast of Donegal, from Donegal town towards Killybegs and Kilcar.

Belfast Undertaking's Assessment

An appeal against the increased valuation of the electricity undertaking is being lodged by the Belfast Corporation Electricity Committee. Under the new assessment the rateable value has been increased by £16,600 to £76,685.

Farm Progress

Mr. J. T. Beresford, London Council delegate, told a meeting of Somerset N.F.U. Executive recently that in the south-west 1,000 farms were connected to the electricity supply last year which, he thought, taking all the economic factors into consideration, was quite a considerable achievement, although it was not quite so fast as he would like.

Weston-super-Mare Economy Measure

Because of the need to prune expenditure, the proposed installation of electricity in over 200 council houses at Weston-super-Mare is not to be proceeded with during the forthcoming financial year. There will, however, be no objection to tenants having the work carried out themselves if they pay for it. By special arrangements, where necessary, the cost of installation will be advanced by the Council and repaid by instalments.

North-Eastern Power Cuts

Lord Citrine, chairman of the B.E.A., is to visit the north-east to look ino the effects of power cuts, but no date has yet been announced. During the past few weeks there have been complaints from firms about the adverse effect on industry of power cuts and load spreading. Some firms have stated that they will refuse to co-operate in load spreading next winter. Recently, the engineering and shipbuilding industries in the north-east stated that within the space of a few months almost a quarter of a million working hours had been lost through power cuts. It has been suggested that the north-east has borne an unfair share of the cuts.

Rotherham Power Failure

A fire at the Prince of Wales power station, Rotherham, last week caused a two-hour breakdown in electricity supplies in the district. It is reported that the fire was caused by a flashover in a busbar chamber.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1944

1049[illegible]. General Electric Co., Ltd., and Jesty, L. C.—Cathode-ray tube apparatus for television transmission. 2nd August, 1946. (637851.)

1945

3228[illegible]. British Thomson-Houston Co., Ltd.—Fluid-blast electric circuit-breakers. 29th November, 1945. (638132.)

1946

15219. General Electric Co., Ltd., and Espley, D. C.—Generation of electric oscillations. 20th August, 1947. (637996.)

18255. Standard Telephones & Cables, Ltd., and Frankton, W. J.—Electrical temperature control arrangements. 13th June, 1947 (638064.)

22969. Boonton Radio Corporation.—Phase or frequency modulating systems. 1st August, 1946. (638137.)

23861. Kapella, Ltd., and Reason, R. E.—Electromagnetic detector devices for use in measuring apparatus. 12th August, 1947. (638138.)

24396. British Thomson-Houston Co., Ltd.—Electron-discharge devices. 16th August, 1946. (638139.)

30401. Standard Telephones & Cables, Ltd.—Directive antenna arrangements, particularly for use in radio direction finders. 11th October, 1946. (638143.)

33301. British Thomson-Houston Co., Ltd.,—Electron optical instruments and cameras therefor. 8th November, 1946. (638146.)

36127. International Business Machines Corporation.—Electronic switching means and commutators. 6th December, 1946. (638066.)

1947

182. Fletcher, A. H., Stark, F. H., Corbitt, R. W., and Sherlaw, W.—Heat-exchangers for gas turbine engines. 1st January, 1948. (638067.)

1097. Philips Lamps, Ltd.—Mixing circuits for ultra-high frequencies. 13th January, 1947. (638004.)

2743. Thornton, A.A. (Magnavox Co.).—Solenoids. 29th January, 1947. (638005.)

3776. Carter, R. H. A.—Presentations for radar and like systems. 8th February, 1947. (638069.)

4304. Standard Telephones & Cables, Ltd.—Gas-burner nozzle structure. 14th February, 1947. (638154.)

5006. Westinghouse Electric International Co.—Alloys. 20th February, 1947. (638007.)

5849. Johnson, H. R.—Navigational systems employing continuous radio waves. 15th March, 1948. (638008.)

6011. Beede, A. H.—Nozzles for suction cleaners. 3rd March, 1947. (638009.)

6338. Japolsky, N. S.—Apparatus for utilization of intra-nuclear atomic energy. 6th April, 1948. (637866.)

7843. McSorley, D. J., and Robins, J. T.—Automatic burglar and fire alarm for use in conjunction with an automatic telephone system. 7th May, 1948. (638155.)

8098. Philips Lamps, Ltd.—Wiring systems for radio and like electrical apparatus. 25th March, 1947. (637869.)

9436. Western Electric Co., Inc.—Delayed-action pulse repeater. 9th April, 1947. (638156.)

9552. Rudorff, D. W. A. Methods and apparatus for cutting electrically conductive materials. 8th April, 1948. (Cognate applications 17853, 7th July, 1947, and 28455, 24th October, 1947.) (637872.)

10405. Standard Telephones & Cables, Ltd.—Direction-finder systems. 18th April, 1947. (638160.)

10447. Marconi Instruments, Ltd., and Bartley, W. B.—Apparatus for the control of industrial chemical processes. 16th April, 1948. (638073.)

10593. British Thomson-Houston Co., Ltd.—Governing systems for prime movers. 21st April, 1947. (638162.)

10600. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Searchlights. 21st April, 1947. (638013.)

13519. Sperry Products, Inc.—Supersonic inspection apparatus. 20th May, 1947. (638165.)

13875. British Thomson-Houston Co., Ltd.—Dish-washing apparatus. 23rd May, 1947. (638075.)

14084. British Thomson-Houston Co., Ltd.—Electric heating units. 27th May, 1947. (637875.)

14228. Marconi's Wireless Telegraph Co., Ltd.—Radio drift and speed indicators for use on aircraft. 28th May, 1947. (638167.)

14568. British Thomson-Houston Co., Ltd.—Steam irons. 2nd June, 1947. (638019.)

14769. Standard Telephones & Cables, Ltd.—Antenna. 4th June, 1947. (638020.)

15130. Pierce Foundation, J. B.—Electrical conductor unit. 10th June, 1947. (Addition to 561728.) (638025.)

15974. Soc. Independante de Télégraphie sans Fil.—High-frequency electronic valve amplifiers. 17th June 1947. (637877.)

16202. Standard Telephones & Cables, Ltd., and Armstrong, L. J. Heaton.—Radio circuits. 18th June, 1948. (638170.)

17292. Babcock & Wilcox, Ltd., and Evans, R. H.—Combustion plant. 1st July, 1948. (638173.)

17543. Westinghouse Electric International Co.—Frequency measuring devices. 3rd July, 1947. (638028.)

18686. Willson. H. C.—Electro-dynamic reproducers or loud-speaking telephones of the moving coil type. 14th June, 1948. (638080.)

19260. Western Electric Co., Inc.—Methods of making electrical resistive elements. 18th July, 1947. (638084.)

20702. Garnier, E. H.—Construction of poles for power transmission or the like. 30th July, 1947. (638089.)

21816. Electroflo Meters Co., Ltd.—Fluid-seals. 8th August, 1947. (637933.)

24590.—Cooper, G. R.—Electric intergrating or control apparatus. 4th October, 1948. (638179.)

25053. Allmanna Svenska Elektriska Aktiebolaget.—Electric regulator with self-magnetized transductor. 12th September, 1947. (638099.)

25805. Compagnie des Lampes.—Electrical heating of articles made of glass or other vitreous material. 23rd September, 1947. (637885.)

26971. Rubbra, A. A.—Gas turbine power plant installations. 6th October, 1948. (638103.)

28498. Dudley, F. E.—Current limiter for electrically driven machine tools. 24th October, 1947. (638105.)

29549. Faulkner, A. W.—Electric primary batteries.—30th October, 1948. (638106.)

29678. Aktiebolaget Elektrolux.—Electrically driven fan units. 7th November, 1947. (638107.)

32406. Parsons, Ltd., C. H., and Handley, G. B.—Lever-operated electric switches for alternating-current curcuits. 8th January, 1949. (638181.)

33802. Standard Telephones & Cables, Ltd.—Electrical contact banks such as are used in wiper switches. 22nd December, 1947. (Cognate application 33803, 20th October, 1945.) (637889.)

33841. Hazeltine Corporation — Frequency-responsive electric system. 22nd December, 1947. (638111.)

1948

1553. Parsons, Ltd., C. H., and Handley, G. B.—Socket units of electrical plug-and-socket connectors. 14th January, 1949. (637936.)

1940. Electrolux, Ltd.—Household refrigerators,—22nd January, 1948. (637937.)

2253. Ericsson Telephones, Ltd., and Hopwood, F. W.—Systems comprising electromagnetic vibratory invertors. 25th January, 1949. (637938.)

3312. Inductive Appliances, Ltd., and Lark, G. T. K.—Circuit arrangements for the operation and control of gas-discharge lamps. 23rd November, 1948. (637894.)

4501. Magnetic Analysis Corporation.—Electromagnetic inspection. 16th February, 1948. (Cognate application 4502 6th November, 1941.) (638120.)

4778.—Metropolitan-Vickers Electrical Co., Ltd.—Variable inductance devices. 18th February, 1948. (637939.)

5104. Metropolitan-Vickers Electrical Co., Ltd.—Dynamo-electric machines. 20th February, 1948. (637896.)

5440. Hackbridge & Hewittic Electric Co., Ltd., and Causon, G. S.—Electrical installations comprising an emergency battery. 24th February, 1948. (Addition to 606383.) (638121.)

5642. British Thomson-Houston Co., Ltd.—Preparation of dialkyl-substituted dihalogenosilanes. 25th February, 1948. (637941.)

6760. Westinghouse Electric International Co.—Electric induction motors. 4th March, 1948. (637900.)

12102. Westinghouse Brake & Signal Co., Ltd., Stevens, S. A., and Duckitt, H.—Detection, measurement or correction of voltage or current variations in electric circuits. 14th April, 1949. (637915.)

14142. General Electric Co., Ltd., Holtom, L. W., and Richardson, J. A.—Power presses and the like and tools therefor. 25th May, 1949. (637916.)

14337. Westinghouse Electric International Co.—Gas turbine power plants. 27th May, 1948. (637917.)

14364. British Thomson-Houston Co., Ltd.—Vacuum cleaners. 27th May, 1948. (637918.)

15159. Cinch Manufacturing Corporation.—Holders for thermionic valves, plugs or other electrical devices provided with projecting prongs. 4th June, 1948. (637949.)

15388. Cole, Ltd., E. K., and Kemp, R.—Control units for radio receivers or the like. 4th June, 1949. (637957.)

15537. Cole, Ltd., E. K., and Jackson, W. J. C.—Fusible electric cut-outs. 4th June, 1949. (637961.)

15688. Haffenden, W. Wilson-.—Electric plugs. 29th March, 1949. (Cognate application 30502, 24th November, 1948.) (637964.)

15818. Edison Swan Electric Co., Ltd., Wilman, D., and Clarke, R. A.—Detachable cover for a lighting fitting. 11th June, 1948. (637967.)

15834.—Remington Rand, Inc.—Dry shaver heads. 11th June, 1948. (637968.)

15868. Revo Eectric Co., Ltd., and Felton A. E.—Safety fittings for electric lamps for mines. 4th June, 1949. (637969.)

15902. Weir, Ltd., G. & J., and Hillier, H.—Deaerating apparatus for boiler feed water. 17th May, 1949. (638198.)

15923. Battersby, D. J.—Terminal connection for storage batteries. 14th June, 1949. (637970.)

16640. Baker Perkins, Ltd., and Gunston D.—Electrically heated biscuit ovens. 21st June, 1948. (Addition to 583156.) (637987.)

16698. Power Centre Co., Ltd., and Stevens, A. H.—Conduits for electric cables. 11th June, 1949. (637988.)

17179. British Thomson-Houston Co., Ltd., Anderson, J.T., and Blood, W. R.—Apparatus for the production of smoke from finely divided materials. 23rd June, 1949. (Addition to 621778.) (638060.)

PUBLIC LIGHTING NOTES

LEAMINGTON Spa Corporation Highways & Planning Committee has recommended that for the lighting of main roads in the borough the approval of the Ministry of Transport should be sought for the provision of fluorescent lighting at an estimated cost of £23,450. For streets, other than main roads, it is proposed to provide a complete new electrical installation, including new concrete columns, at an estimated cost of £27,373.

On 30th March, electric street lighting was switched on for the first time in PONTEFRACT by Councillor T. P. Brindley, chairman of the Street Lighting Committee. The scheme provides for the lighting of Southgate by 37 mercury 250 W lamps. This is a Class "A" road of dual carriageway, and the lamps are attached to existing steel columns in the centre of the road.

The ELLESMERE PORT (Wirral) surveyor is to prepare a scheme for sodium lighting along the main road from Hooton Cross Roads to Great Sutton. The road carries a considerable amount of traffic between Birkenhead and Chester.

The borough surveyor of HENDON has submitted for the consideration of the Highways Committee a suggested street lighting improvement programme for 1950-51. The proposals cover parts of the North Circular Road, Elstree Hill, Hendon Way, and Edgware Road (awaiting approval of the Ministry of Transport), and Hampstead Way, Wellgarth Road, Watling Avenue (remaining portion), and Woodcroft Avenue. The estimated cost of the works is £24,320.

The chief constable of BIRKENHEAD has reported to the Watch Committee that he has included in the draft estimates the cost of 61 schemes for the conversion of street lighting from gas to electricity.

A scheme for the installation of fluorescent lighting in the NUNEATON Town Centre at an estimated cost of £4,303 is recommended for approval in principle.

A scheme of fluorescent lighting has recently been completed in WELLINGBOROUGH. It comprises 27 "Mazda" lanterns each with three 5ft 80 W lamps. The units are situated in the main shopping area of the town, spaced at average intervals of 120ft and mounted at a height of 25ft.

Lighting engineers of the B.T.H. Birmingham District Office planned the scheme, collaborating with the East Midlands Electricity Board at Wellingborough, whose resident engineer, Mr. C. A. Cullimore, was in charge of the installation.

This new lighting has been the subject of interest and favourable comment on the part of other local authority lighting engineers, who visited the site at the invitation of the Area Board.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Altrincham.—28th April. Corporation. Street lighting installation Stamford New Road. (See this issue.)

Australia.—BRISBANE.—9th June. City Council. 33 kV underground and submarine cable, multi-core underground and submarine pilot cable. (C.R.E. (I.B.) 47945/50. Ten/1123.)*

5th May. 33 kV air break switches and isolators. (C.R.E. (I.B.) 47941/9. Ten/1134.)*

19th May. 33 kV oil circuit breakers. (C.R.E. (I.B.) 47917/50. Ten/1131.)*

MELBOURNE.—State Electricity Commission of Victoria. The closing date for the receipt of tenders for 28 overhead travelling cranes has been extended to 19th April. (See this issue.)

Bootle.—24th April. Corporation. Sodium lighting equipment. (See this issue.)

Bournemouth.—14th April. Town Council. Two pairs of vertical electrically operated passenger lifts for use on the sea front, each to carry approximately 30 passengers. Borough engineer, Town Hall.

Durham.—County Council. Electrical installations in 10 police houses at Aycliffe. County architect, Court Lane, Durham.

Edinburgh.—17th May. North of Scotland Hydro-Electric Board. Construction of approximately 250 miles of wood pole overhead distribution lines in the Island of Skye. (See this issue.)

Kirkcaldy.—18th April. Town Council. Electrical work in connection with erection of 36 flats at Winifred Crescent. J. Gentles and Sons, 162, High Street, Kirkcaldy.

Margate.—17th April. Corporation. Installation of decorative lighting scheme and supply of 10,000 strip lighting lamps. (See 7th April issue.)

Nottingham.—17th April. Corporation. Electrically driven booster pumps at Normanton-on-the-Wolds, Bingham. B. W. Davies, general manager, Water Department, Castle Boulevard.

Pakistan.—1st May. Director of Supplies (Engineering), Department of Supply and Development. Switchgear, transformers and line equipment for the Dargai Hydro-Electric Scheme. (C.R.E. (I.B.) 47419/50. Ten/1119A.)*

Reigate.—28th April. Corporation. Electrical rewiring of Town Hall. (See 7th April issue.)

Southport.—19th April. Town Council. Electrical installations in 18 houses, Grantham Road (site 12). Borough engineer, Town Hall.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

ORDERS PLACED

Hartlepool.—Town Council. Twelve months' supply of electrical materials.—J. Watson & Co., Newcastle-on-Tyne.

London.—County Council. Installation of electric lighting and an electric fire alarm system at Banstead Residential School.—Johnson & Tanner, Ltd., Worcester Park.

Northumberland. — Education Committee. Tenders recently accepted for electrical work at schools include the following:— Morpeth Girls' Grammar (£1,071).—Hartley Electromotives, Newcastle-on-Tyne. Bedlington County Primary (£632).—Morris & Smiles, Wallsend. Newbiggin C. of E. (£999).—Falconar Cross & Co., Newcastle-on-Tyne. Whitley North County Primary (£649).—A. J. Jamieson, Forest Hall. Hexham County Primary (£590).—Moffett & Son, Corbridge.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnard Castle.—Houses (16), Middleton in Teesdale; surveyor, Rural Council Offices, Barnard Castle.

Birmingham.—Dwellings, Elmstead Avenue, Sheldon (32), Brays Road, Elms estate (14), Thurleston Road, Longbridge (44) and Coombes Lane, Longbridge (12); H. J. Manzoni, city engineer, Civic Centre.

Blaydon-on-Tyne.—Dyeworks for British Celanese, Ltd.; North-Eastern Trading Estates, Ltd., Low Fell, Gateshead.

Bristol.—Flats (31), Great Ann Street, for Housing Committee; J. Nelson Meredith, city architect, Eagle House, Colston Avenue, Bristol.

Caterham.—Block of 22 flats, Banstead Road; Briant A. Poulter, architect, Stonebank, Warlingham, Surrey.

Chester.—Development scheme at City Hospital (£21,000) for Liverpool Regional Hospital Board; T. N. Mitchell, architect to Board, Alder Hey Hospital, Liverpool.

Chippenham.—New buildings, Cocklebury Road, for North Wilts. Area College; F. I. Bowden, county architect, County Hall, Trowbridge.

Cockfosters.—Flats (24) and eight garages, Westpole Avenue; J. R. Scarborough, 102, The Mall, N.14.

Coventry.—Restoration of Fords Hospital; Hattrell & Partners, architects, 1, Queens Road.

Crayford.—New works; Fredk. Braby & Co., Ltd., 352, Euston Road, N.W.1.

Didsbury (Manchester).—Extensions to the Shirley Institute (£500,000); British Cotton Industry Research Association.

Dundee.—Reconstruction of bedding factory; Royal Institution for the Blind, 59, Maudlin Yard Road.

Edinburgh.—Foundry extensions; Miller & Co., Ltd., London Road.

Folkestone.—Houses (32), Biggins Wood, in three contracts; borough engineer, Municipal Offices, West Terrace.

Frome.—Divisional headquarters, courts and housing, for the Home Office; Carter and White, builders, Shepton Mallet.

Grimsby.—Rebuilding premises, Cleethorpe Road; W. H. Smith & Son, Ltd., Portugal Street, London, W.C.2.

Guiseley.—Extensions at Nunroyd Mills for J. & C. Peate, Ltd.; M. Yeadon & Sons, Ltd., St. Johns Drive, Yeadon, nr. Leeds.

Halifax.—Houses (62), Illingsworth site; borough engineer.

Harrow.—Large factory extension; Kodak, Ltd., Headstone Drive.

Hebburn-on-Tyne.—Houses (56), Hartleyburn housing site for the U.D.C.; Page, Son and Hill, architects, 75, King Street, South Shields.

Hendon.—Flats (44), Abercorn Road, Mill Hill; borough engineer, Town Hall, N.W.4.

Heywood.—Ice cream factory at Adelaide Street; Parker & Calvert, Pine Street.

Ipswich.—Junior school, Castle Hill; Johns and Slater, architects, 32, Foundation Street.

Jarrow-on-Tyne.—Factory additions Bede Trading Estate for Abbott's Laboratories, Ltd. (£58,000); Holland and Hannen and Cubitts, contractors, Jesmond, Newcastle-on-Tyne.

Kent.—New school at Rochester (£140,000); Moirett & Wood, architects, 81, Queen Victoria Street, London, E.C.4.

Kidsgrove.—Houses for U.D.C., Crown Bank estate (88); R. Dayson, 8, Oakdene Close, Dimsdale, Wolstanton. Galley Bank estate (16); H. Hoskins, Furlong Road, Tunstall.

Ledbury.—Rebuilding Christ Church, Wellington Heath; Scriven, Powell & James, architects, King Street, Hereford.

Leeds.—Rayon technology building at the University (£100,000); Lanchester and Lodge, architects, London.

London.—CATFORD.—Shops, stores and offices, 177/181, Rushey Green; Stocker & Roberts, 29, Lewisham High Street, S.E.13.

HAMPSTEAD.—Eight blocks of flats and maisonettes, Mortimer Crescent, for L.C.C.; Ansell & Bailey, architects, 5, Verulam Buildings, W.C.1.

Manchester.—Research laboratories, Christie Hospital, Didsbury; Wm. Thorpe & Sons, Chester Rd., Trafford Park, Manchester.

Newcastle-on-Tyne.—Extensions to factory for Dairy Produce Packers, Ltd.; J. R. Wallace, Northumberland Square, North Shields.

County primary school Stocksfield Avenue; city architect, 18, Cloth Market.

Houses (22), Slingsby Gardens; J. T. Bell & Son, 7, Northumberland Place, Newcastle.

Northumberland.—Secondary modern school at Seaton Burn (£127,600), primary school at Wallsend (£65,000), modern school at Wooler (£85,100) and primary school at Earsdon (£94,550); county architect, County Hall, Newcastle-on-Tyne.

Oswestry.—Flats (£60,250) for R.D.C.; F. Roberts & Sons, Trevor, nr. Wrexham.

Redditch.—Secondary modern school for Worcestershire E.C.; Richard Sheppard and Partners, architects, 16, Bedford Place, London, W.C.1.

Rotherham.—Factory, Bawtry Road, Brinsworth; British Oxygen Co., Ltd., Grosvenor House, Park Lane, W.1.

Rothwell.—Houses, Lawrence Villa, for U.D.C.; Dunhill Bros., Leeds (32), and F. & C. Leach, Ltd., Park Lane, Pontefract (32).

Sheffield.—Rebuilding factory (£150,000); E. Greaves and Son, Ltd., Eyre Street.

Extensions to engineering departments at the University (£350,000); Sheffield University Authorities.

Southend-on-Sea.—High school for boys, Belfairs, Leigh-on-Sea; architect to E.C., 30, Alexandra Street.

Southgate.—Houses (54), Morton Way, for police officers; police architect and surveyor, New Scotland Yard, S.W.1.

South Shields.—Marine school and technical college (£100,000); borough architect.

Southwell (Notts.).—Houses (42), Bleasby and Farnsfield, for R.D.C.; S. Cooper, surveyor, 8, Westgate.

Stafford.—Houses (130), Rickerscote Village estate; William Whittingham, Ltd., Wolverhampton.

Stanford-le-Hope.—Oil refinery, Coryton; Powell Duffryn, Ltd., Powell Duffryn House, Cardiff.

Stockport.—Houses (76) at Houldsworth estate; W. Farley & Co., Ltd.

Stoke-on-Trent.—Partial rebuilding of Theatre Royal, Hanley; G. A. Greaves, architect, 45, Trinity Street, Hanley.

Uttoxeter.—Houses (80), Mayfield; R.D.C. surveyor.

Walthamstow.—Rebuilding premises, 279-281, High Street; Montague Burton, Ltd., Hudson Road, Leeds.

Warwick.—Conversion of "Finham Hostel" into 98 flats; R.D.C. surveyor.

West Bromwich.—Works extensions; Vowles Aluminium Co., Ltd., Bank Street.

West Ham.—36 flats, West Road and Park Road; borough architect.

West Hartlepool.—Primary school; S. M. Richmond, borough architect, Municipal Buildings.

West Riding.—New schools at Hebden Bridge, Sowerby Bridge and Todmorden; county architect, Wakefield.

Wigan.—Technical college; A. Royle, town clerk, Library Street.

Willenhall.—Houses (100), Beacon Colliery estate; Scott & Clark, architects to U.D.C., Wednesbury.

Witton-le-Wear.—Houses (32), for U.D.C.; T. A. Page, Son & Hill, 75, King Street, South Shields.